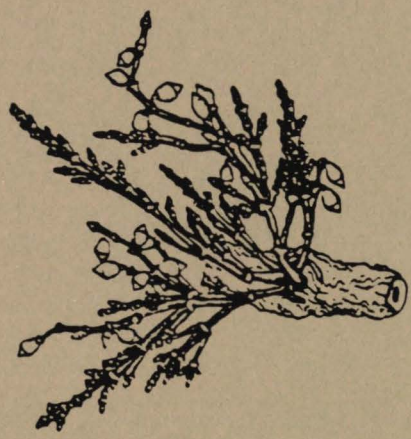
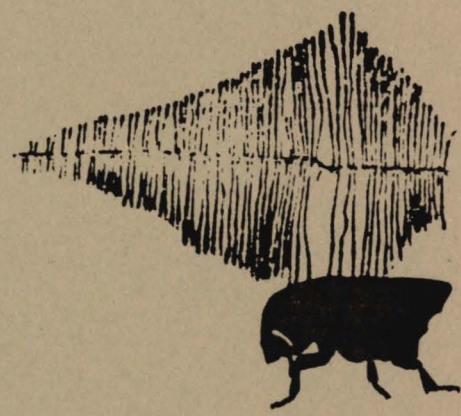
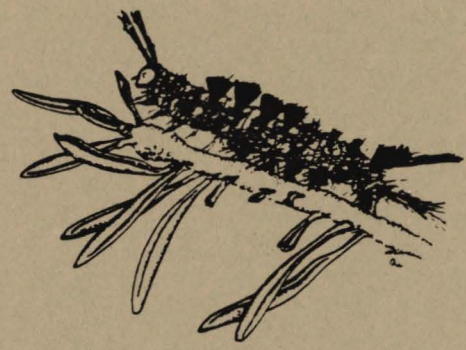
SB761
U7N6
#94-1

IDAHO FOREST INSECT & DISEASE CONDITIONS & PROGRAM SUMMARY 1993







IDAHO Department of Lands
USDA Forest Service
Northern & Intermountain Regions

Report No. 94-1

IDAHO DEPARTMENT OF LANDS

FOREST SERVICE US DEPARTMENT OF AGRICULTURE

IDAHO FOREST INSECT AND DISEASE CONDITIONS AND PROGRAM SUMMARY

1993

Compiled by

David P. Beckman
Robert L. Mathiasen
Sandra J. Kegley
K. Andrew Knapp
R. Ladd Livingston
James T. Hoffman
Julie C. Weatherby
Robert L. James
John W. Schwandt
Ralph E. Williams

Idaho Department of Lands

USDA Forest Service, Northern and Intermountain Regions

LIBRARY COPY
ROCKY MT. FOREST & RANGE
EXPERIMENT STATION

DIRECTORY OF PERSONNEL

Idaho Department of Lands
Bureau of Private Forestry
P.O. Box 670
Coeur d'Alene, IDAHO 83814

Phone: (208) 769-1525
FAX: (208) 769-1524
DG Address: IDL.BPF:R01F04A

William E. Love	Bureau Chief
R. Ladd Livingston	Section Supervisor, Entomologist
Robert L. Mathiasen	Plant Pathologist
David P. Beckman	Insect & Disease Technician

USDA Forest Service, Northern Region (R-1)
Timber, Cooperative Forestry and Pest Management (TCFPM)
Federal Building
P.O. Box 7669
Missoula, MONTANA 59807

Phone: (406) 329-3605
FAX: (406) 329-3132
DG Address: R01A

William W. Boettcher	Assistant Director
Robert G. Eder	Computer Programmer/Analyst
Edward C. Monnig	Pesticide Coordinator
Jerald E. Dewey	Missoula Field Office Group Leader
Nancy J. Campbell	Entomologist
Kenneth E. Gibson	Entomologist
Larry E. Stipe	Entomologist
Susan K. Hagle	Plant Pathologist
I. Blakey Lockman	Plant Pathologist
Jane E. Taylor	Plant Pathologist
Alice K. Green	Biological Technician
Carma J. Gilligan	Biological Technician
Tim McConnell	Biological Sciences Technician

Idaho Panhandle National Forest's
Forest Pest Management Field Office
1201 Ironwood Drive
Coeur d'Alene, IDAHO 83814

Phone: (208) 765-7420
FAX: (208) 765-7307
DG Address: R01F02A

James W. Byler *	Coeur d'Alene Field Office Group Leader
Sandra J. Kegley (Gast)	Entomologist
Robert L. James	Plant Pathologist
John W. Schwandt	Plant Pathologist
Carol S. Bell *	Entomologist
Robert D. Oakes *	Biological Technician

* relocating to the Coeur d'Alene Field Office June 1, 1994

DIRECTORY OF PERSONNEL, cont.

USDA Forest Service, Intermountain Region (R-4)
Forest Pest Management
Federal Building
324 - 25th Street
Ogden, UTAH 84401

Phone: (801) 625-5253
FAX: (801) 625-5127
DG Address: R04A

Garth E. Baxter	Pesticide Coordinator

USDA Forest Service, Intermountain Region (R-4)
Forest Pest Management
Ogden Field Office
4746 South 1900 East
Ogden, UTAH 84403

Phone: (801) 476-9720
FAX: (801) 479-1477
DG: Address S22L02A

Leon A. LaMadeleine	Field Office Representative
John A. Anhold	Entomologist
Dawn E. Hansen	Entomologist
A. Steven Munson	Entomologist
John Guyon	Plant Pathologist
Valerie L. DeBlander	Biological Technician
Gary Otwell	Biological Technician
Nancy P. Wright	Computer Assistant
Al Dymerski	Forest Technician
Matt Hansen	Forest Technician

USDA Forest Service, Intermountain Region (R-4)
Forest Pest Management
Boise Field Office
1750 Front Street, Room 202
Boise, IDAHO 83702

Phone: (208) 364-4220
FAX: (208) 364-4111
DG Address: R04F02A

Ralph E. Williams	Field Office Representative
Ralph W. Thier	Entomologist
James T. Hoffman	Plant Pathologist
Julie C. Weatherby	Entomologist
Joy C. Roberts	Computer Programmer Analyst
K. Andrew Knapp	Biological Technician
Brain R. Gardner	Biological Technician
Philip J. Mocettini Jr.	Biological Technician
Richard L. Halsey	Biological Technician
Janet L. Cheney	Office Management Assistant
Tom N. Barbouletos	Forester

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
CONDITIONS IN BRIEF	1
FOREST INSECTS	2
BARK BEETLES	
Mountain Pine Beetle	2
Pine Engraver	6
Western Pine Beetle	6
Spruce Beetle	6
Douglas-fir Beetle	11
Fir Engraver	11
Western Balsam Bark Beetle	11
Red Turpentine Beetle	13
DEFOLIATORS	
Douglas-fir Tussock Moth	15
Western Spruce Budworm	15
Gypsy Moth	21
OTHER INSECTS	
Balsam Woolly Adelgid	23
Cranberry Girdler Moth	23
Terminal Weevils	23
Pine Sheath Miner	23
Rusty Tussock Moth	23
Cone and Seed Insects	24
Tip Moths	25
FOREST DISEASES	26
STEM AND BRANCH DISEASES	26
Dwarf Mistletoes	26
ROOT DISEASES	26
VASCULAR WILTS	26
FOLIAGE DISEASES	27
ABIOTIC DAMAGE	27
Hail Damage	27

TABLE OF CONTENTS cont.

	PAGE
DISEASES OF NURSERIES AND TREE IMPROVEMENT AREAS	
Botrytis cinerea	28
Fusarium acuminatum	28
Botrytis cinerea	28
Pathogenic fungi	28
Sirococcus strobilinus	28
COMMON AND RECURRING NURSERY DISEASES	28
STATUS OF CHRONIC DISEASE PROBLEMS	29
SUMMARY OF DISEASE AND INSECT PROJECTS	32
COMMON AND SCIENTIFIC NAMES OF INSECTS	37
COMMON AND SCIENTIFIC NAMES OF DISEASES	38
RECENT PUBLICATIONS	40
MAP SHOWING AREAS INFESTED WITH DOUGLAS-FIR BEETLE, WESTERN PINE BEETLE, PINE ENGRAVER, AND MOUNTAIN PINE BEETLE.	43
MAP SHOWING AREAS INFESTED WITH BALSAM WOOLLY ADELGID, FIR ENGRAVER, SPRUCE BEETLE, AND WESTERN BALSAM BARK BEETLE.	44

LIST OF TABLES

		PAGE
Table 1a.	Idaho Statewide summary; annual mountain pine beetle (MPB) mortality by reporting area: Northern Idaho.	3
Table 1b.	Idaho Statewide summary; annual mountain pine beetle (MPB) mortality by reporting area: Southern Idaho.	4
Table 2a.	Idaho Statewide summary; annual bark beetle mortality by reporting area: Northern Idaho.	7
Table 2b.	Idaho Statewide summary; annual bark beetle mortality by reporting area: Southern Idaho.	8
Table 3.	Estimated spruce beetle caused mortality, 1985 - 1993.	10

LIST OF TABLES cont.

		PAGE
Table 4a.	Idaho Statewide summary; annual bark beetle mortality by reporting area: Northern Idaho.	12
Table 4b.	Idaho Statewide summary; annual bark beetle mortality by reporting area: Southern Idaho.	13
Table 5a.	Acres of Douglas-fir Tussock Moth defoliation as determined by aerial surveys.	16
Table 5b.	Acres of Western Spruce Budworm defoliation as determined by aerial surveys.	16
Table 6.	Means of average moth catch per 5 pheromone trap/sample plots in Idaho, 1993-1983.	18
Table 7.	Dwarf Mistletoe Accomplishments - Southern Idaho, 1993.	26

LIST OF FIGURES

		PAGE
Figure 1.	Northern and Southern Idaho Mountain Pine Beetle Mortality by Host Species 1992 - 1993.	5
Figure 2.	Northern and Southern Idaho Pine and Spruce Mortality by Bark Beetle Species 1992 - 1993.	9
Figure 3.	Northern and Southern Idaho Fir Mortality by Bark Beetle Species 1992 - 1993.	14
Figure 4.	Acres of Western Spruce Budworm defoliation as determined by Aerial Surveys in Northern and Southern Idaho 1983 - 1993.	17
Figure 5.	USFS and IDL Douglas-fir Tussock Moth Trap Catches in Northern Idaho 1983 - 1993.	19
Figure 6.	USFS Douglas-fir Tussock Moth Trap Catches in Southern Idaho 1983 - 1993.	20
Figure 7.	State of Idaho 1993 Gypsy Moth Catch Sites.	22

INTRODUCTION

This report summarizes major insect and disease damage on forested lands of all ownerships within the State of Idaho for 1993. Much of the information for this report was derived from aerial and ground surveys and associated detection and evaluation activities by pest management personnel within the USDA Forest Service and the Idaho Department of Lands. Losses outlined in tables are only estimates. Likewise, maps outlining areas of major insect infestations provide general locations of problems.

This report also includes brief descriptions of projects insect and disease specialists are conducting in addition to the training and other technical assistance provided on a regular basis.

CONDITIONS IN BRIEF

FOREST INSECTS

The weather in northern Idaho has dramatically affected many insect populations once again. This year, opposite of 1992, we had an unusually cold and wet spring and summer. This delayed or prolonged insect emergence and flight periods, generally having a negative affect on their populations. As a result, we saw a decline in most insect activity, especially defoliators, in 1993. Due to the delayed fading of bark beetle infested trees, the effect of the weather on their populations should be detected in 1994.

FOREST DISEASES

Since disease mortality is not usually as apparent as insect outbreaks or forest fires, the extent of losses from diseases is difficult to measure accurately. Root diseases, white pine blister rust, dwarf mistletoes, and nursery diseases continue to cause serious problems throughout much of the state. Although impacts may be quite severe, the aerial surveys which provide most of the data for this report do not usually record these diseases because they are difficult to detect from the air.

However, needlecast of lodgepole pine was widespread throughout the range of lodgepole pine in Idaho and western Montana.

FOREST INSECTS

BARK BEETLES

MOUNTAIN PINE BEETLE

In northern Idaho, total mortality attributed to the mountain pine beetle in all hosts remained about the same from 1992 to 1993. Differences occurred, however, between the different hosts. After ground checking many western white pine stands, much of the mortality recorded in 1992 was due to white pine blister rust or other agents, with mountain pine beetle activity mainly in the larger diameter, old growth western white pine. Therefore the numbers reported in 1992 overestimated mountain pine beetle caused mortality in western white pine (Table 1a, Figure 1). Only about 950 western white pine trees were reported killed by mountain pine beetle in 1993.

Increases in mountain pine beetle caused mortality occurred, however, in the other major hosts, ponderosa pine and lodgepole pine. Ponderosa pine mortality increased from about 4,000 trees in 1992 to over 8,000 trees in 1993 (Table 1a, Figure 1). Most activity occurred in the Craig Mountains south of Lewiston and on the Nez Perce National Forest (NF) and Nez Perce Indian Reservation (IR).

In lodgepole pine stands, mortality increased from over 4,000 trees killed in 1992 to over 7,000 in 1993 (Table 1a, Figure 1). Most of the activity occurred in the Bonners Ferry Ranger District (RD) of the Idaho Panhandle National Forest's (IPNF's), the Mica Fire Protection District (FPD), and Pend Oreille, reporting area and in the Craig Mountains. Ground surveys conducted on the Bonners Ferry RD in the Boulder Creek and Placer Creek drainages indicate a general declining trend, although in some areas the beetle is still quite active. The cool, wet weather during the flight period is thought to have contributed to the decline. However, as environmental conditions become favorable again, the beetle is expected to rebound since many highly susceptible lodgepole pine stands still exist. There will probably be a decrease in activity detected by aerial survey in 1994.

Very little mountain pine beetle activity occurred in whitebark pine ecosystems in northern Idaho.

Increases in mountain pine beetle tree mortality occurred in southern Idaho; 41,300 trees were killed in 1993, compared to 10,500 trees killed in 1992 (Table 1b, Figure 1). A slight decrease in mountain pine beetle activity in whitebark pine was observed throughout southern Idaho. The largest single area of tree mortality was located within the Sawtooth Recreation Area (RA) on the Sawtooth National Forest (NF). Smaller outbreaks were located on all other NF's in southern Idaho.

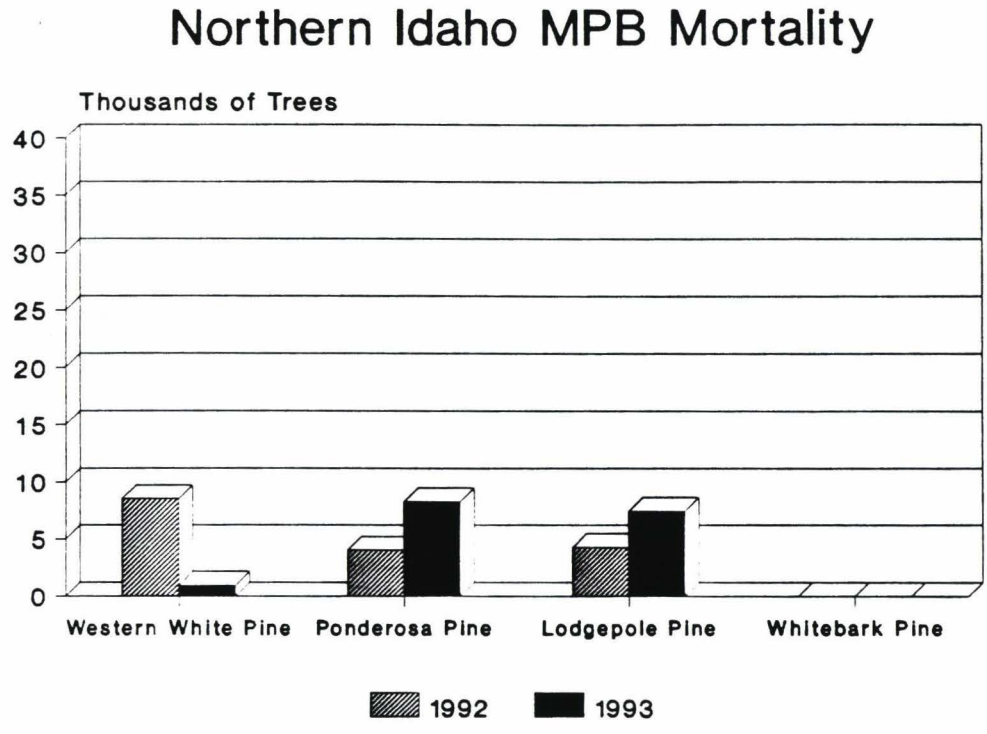
Table 1a. Idaho Statewide summary; annual mountain pine beetle (**MPB**) mortality by reporting area: **Northern Idaho.**

		MPB (white pine) Estimated Mortality			**MPB** (ponderosa pine) Estimated Mortality			**MPB** (lodgepole pine) Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Bitterroot	1993	0	0	0.0	12	23	1.8	6	20	1.8
	1992	0	0	0.0	4	6	0.5	2	5	0.4
Cataldo	1993	2	20	8.0	33	92	7.4	13	160	14.4
	1992	192	358	143.2	19	16	1.3	12	60	5.4
Clearwater	1993	68	71	28.4	4	3	0.2	562	270	24.3
	1992	1,271	1,011	404.4	0	0	0.0	123	474	42.7
CPTPA*	1993	0	0	0.0	0	0	0.0	47	100	9.0
	1992	0	0	0.0	0	0	0.0	10	50	4.5
Craig Mtns.	1993	0	0	0.0	564	3,880	310.4	629	1,161	104.5
	1992	0	0	0.0	499	1,869	149.5	54	210	18.9
Panhandle	1993	560	812	324.8	491	609	48.7	2,040	2,425	218.3
	1992	7,096	6,813	2,725.2	306	51	4.1	1,321	1,543	138.9
Kendrick	1993	0	0	0.0	0	0	0.0	2	10	0.9
	1992	0	0	0.0	0	0	0.0	18	45	4.0
Kootenai Valley	1993	6	6	2.4	127	270	21.6	141	179	16.1
	1992	143	75	30.0	0	0	0.0	2	2	0.2
Maggie Creek	1993	0	0	0.0	4	15	1.2	2	10	0.9
	1992	0	0	0.0	33	28	2.2	4	8	0.7
Mica	1993	4	6	2.4	450	666	53.3	206	1,158	104.2
	1992	18	34	13.6	131	130	10.4	181	574	51.7
Nez Perce	1993	8	9	3.6	476	1,158	92.6	488	573	51.6
	1992	83	55	22.0	132	375	30.0	337	335	30.1
Pend Oreille	1993	62	22	8.8	107	225	18.0	199	1,039	93.5
	1992	152	157	62.8	36	49	3.9	121	171	15.4
Priest Lake	1993	0	0	0.0	0	0	0.0	2	5	0.4
	1992	2	15	6.0	0	0	0.0	0	0	0.0
West St. Joe	1993	0	0	0.0	187	200	16.0	76	315	28.3
	1992	0	0	0.0	104	300	24.0	15	35	3.1
Coeur d'Alene IR	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
Nez Perce IR	1993	0	0	0.0	73	1,125	90.0	0	0	0.0
	1992	0	0	0.0	310	1,207	96.6	294	785	70.6
North Idaho Totals	**1993**	**710**	**946**	**378.4**	**2,528**	**8,266**	**661.2**	**4,413**	**7,425**	**668.2**
	1992	8,957	8,518	3,407.2	1,574	4,031	322.5	2,494	4,297	386.6

* Clearwater-Potlatch Timber Protective Association

Table 1b. Idaho Statewide summary; annual mountain pine beetle (**MPB**) mortality by reporting area: **Southern Idaho.**

		MPB (whitebark pine) Estimated Mortality			**MPB** (ponderosa pine) Estimated Mortality			**MPB** (lodgepole pine) Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Boise	**1993**	125	250	27.5	200	200	8.0	875	1,350	86.4
	1992	300	1,821	200.3	0	0	0.0	900	643	41.2
Caribou	**1993**	25	50	5.5	0	0	0.0	475	850	54.4
	1992	0	0	0.0	0	0	0.0	6,700	5,156	330.0
Challis	**1993**	150	325	35.8	0	0	0.0	2,150	3,975	254.4
	1992	300	246	27.1	0	0	0.0	700	1,123	71.9
Payette	**1993**	1,800	2,000	220.0	1,200	1,700	68.0	400	600	38.4
	1992	1,800	1,936	213.0	0	0	0.0	100	28	1.8
Salmon	**1993**	50	100	11.0	200	300	12.0	1,250	2,400	153.6
	1992	200	262	28.8	300	262	10.5	200	233	14.9
Sawtooth	**1993**	125	250	27.5	0	0	0.0	9,875	17,950	1,148.8
	1992	300	412	45.3	0	0	0.0	3,500	4,909	314.2
Targhee	**1993**	50	50	5.5	0	0	0.0	250	450	28.8
	1992	50	44	4.8	0	0	0.0	50	93	6.0
State Land	**1993**	0	0	0.0	0	0	0.0	200	300	19.2
	1992	0	0	0.0	0	0	0.0	0	0	0.0
Indian Res.	**1993**	0	0	0.0	0	0	0.0	100	400	25.6
	1992	0	0	0.0	0	0	0.0	0	0	0.0
BLM	**1993**	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
Other	**1993**	100	100	11.0	2,400	1,000	40.0	14,100	6,700	428.8
	1992	0	0	0.0	0	0	0.0	0	0	0.0
South Idaho Totals	**1993**	2,425	3,125	343.8	4,000	3,200	128.0	29,675	34,975	2,238.4
	1992	2,950	4,721	519.3	300	262	10.5	12,150	12,185	779.8
State Totals	**1993**	**2,431**	**3,136**	**345.0**	**6,528**	**11,466**	**789.2**	**34,088**	**42,400**	**2,906.6**
	1992	3,431	4,907	539.8	1,874	4,293	333.0	14,644	16,482	1,166.4
State Totals (white pine)	**1993**	**710**	**946**	**378.4**						
	1992	8,957	8,518	3,407.2						



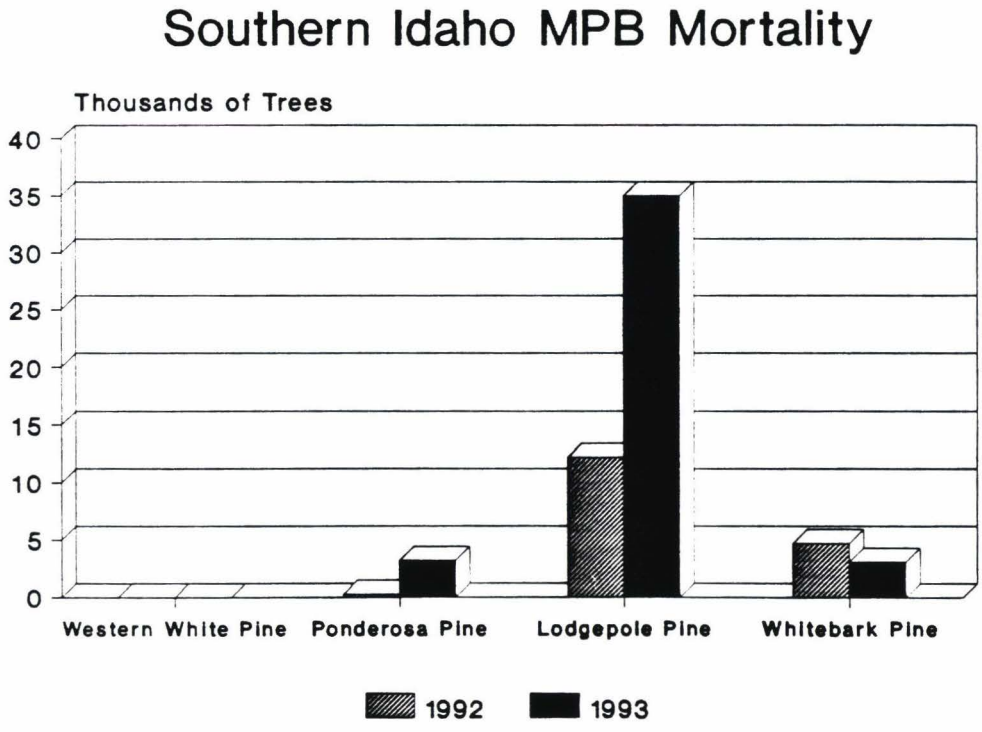


Figure 1. Northern and Southern Idaho Mountain Pine Beetle Mortality by Host Species 1992 - 1993

PINE ENGRAVER

Pine engraver populations greatly increased in North Idaho in the 1993 survey, going from 15 trees in 1992 to 7,542 in 1993 (Table 2a, Figure 2). This increase is probably due to the mild winter and very early spring in 1992 which contributed to increased numbers of successful attacks and subsequent population build up. These attacked trees have shown up in the 1993 survey. The spring and summer of 1993 was very wet and cool, and the number of attacks observed in the 1994 survey may decline once again. The majority of killed trees are in the area to the west and north of Coeur d'Alene, where the beetles attacked and killed many small lodgepole pine creating several dead tree groups throughout the area.

Activity of pine engraver beetle, often associated with western pine beetle, increased on the Boise and Payette NF's in southern Idaho (Table 2b, Figure 2).

In southern Idaho, on certain State lands in the Boise Basin, there was a substantial increase in killed ponderosa pine. These trees, ranging from 6 to 18 inches dbh, were leave trees after timber harvest operations. Apparently, the harvested trees had filled with pine engraver beetles and were not removed in time to avoid the emergence of the next generation. When these new beetles emerged, they attacked standing leave trees of all sizes, killing many that would have served as the basis for the next harvest rotation.

WESTERN PINE BEETLE

Western pine beetle activity in northern Idaho experienced a large increase in 1993. Over 13,000 trees on 3,900 acres were detected in 1993 compared to close to 5,000 trees on just over 1,700 acres in 1992 (Table 2a, Figure 2). Most of the activity occurred on State and private land in the Craig Mountains, Mica FPD, and Pend Oreille and West St. Joe reporting areas.

This beetle continues to be active on the Boise and Payette NF's in southern Idaho where 18,500 trees were killed, an increase from 1992 mortality levels (Table 2b, Figure 2). As western pine beetle and pine engraver beetle frequently occur together. Some tree mortality attributed to western pine beetle may have been due to the pine engraver beetle, an insect with a similar signature.

SPRUCE BEETLE

In northern Idaho, spruce beetle activity continued to decline with only 78 faded trees detected on 111 acres in 1993 (Table 2a, Figure 2). Activity occurred in small scattered groups on the Nez Perce, Clearwater, and Idaho Panhandle NF's.

In southern Idaho mortality from spruce beetle infestations remained static during 1993. With 35,700 trees killed on the Payette NF, the largest infestation in Idaho, as compared to just under 32,000 trees in 1992. (Table 2b, Figure 2).

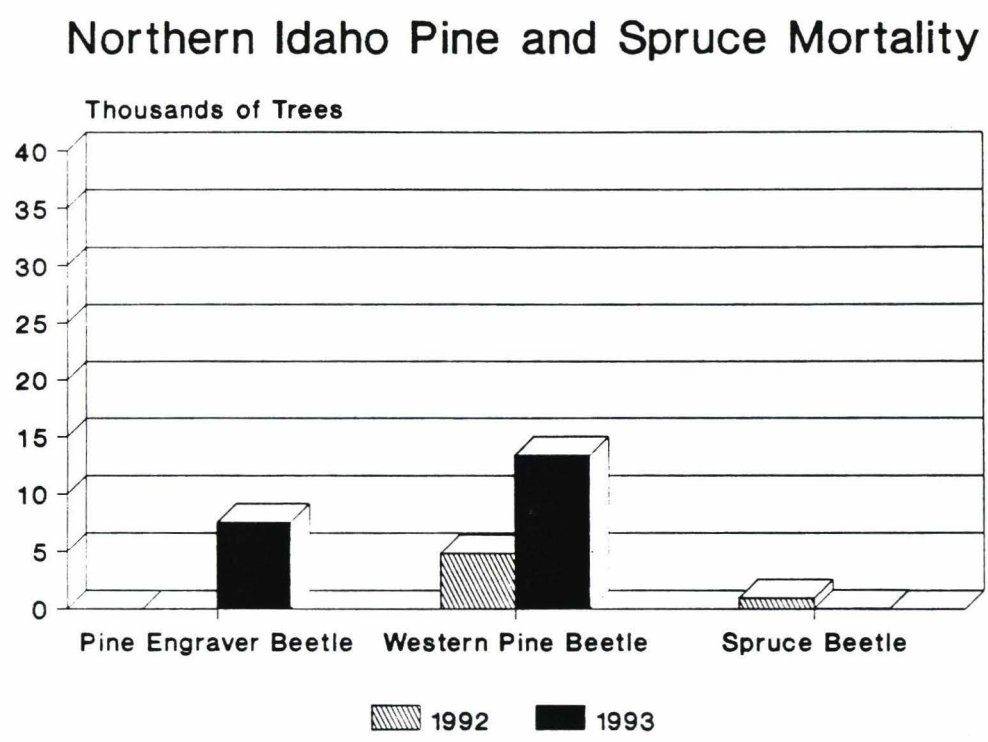
Table 2a. Idaho Statewide summary; annual bark beetle mortality by reporting area: **Northern Idaho.**

		Pine Engraver Beetle Estimated Mortality			**Western Pine Beetle** Estimated Mortality			**Spruce Beetle** Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Bitterroot	1993	0	0	0.0	8	4	1.6	0	0	0.0
	1992	0	0	0.0	8	5	2.0	0	0	0.0
Cataldo	1993	0	0	0.0	4	15	6.0	0	0	0.0
	1992	0	0	0.0	11	22	8.8	0	0	0.0
Clearwater	1993	0	0	0.0	6	3	1.2	4	7	2.8
	1992	0	0	0.0	28	52	20.8	221	186	74.4
CPTPA*	1993	8	65	1.6	130	156	62.4	0	0	0.0
	1992	0	0	0.0	14	32	12.8	0	0	0.0
Craig Mtns.	1993	126	665	16.6	367	1,657	662.8	0	0	0.0
	1992	0	0	0.0	45	133	53.2	0	0	0.0
Panhandle	1993	7	110	2.8	142	625	250.0	18	31	12.4
	1992	0	0	0.0	319	446	178.4	26	69	27.6
Kendrick	1993	8	50	1.3	143	636	254.4	0	0	0.0
	1992	0	0	0.0	180	623	249.2	0	0	0.0
Kootenai Valley	1993	8	75	1.9	2	1	0.4	0	0	0.0
	1992	0	0	0.0	14	16	6.4	0	0	0.0
Maggie Creek	1993	0	0	0.0	20	66	26.4	0	0	0.0
	1992	0	0	0.0	14	17	6.8	0	0	0.0
Mica	1993	521	5,397	134.9	1,085	5,829	2,331.6	0	0	0.0
	1992	2	15	0.4	509	1,666	666.4	0	0	0.0
Nez Perce	1993	29	60	1.5	346	457	182.8	90	40	16.0
	1992	0	0	0.0	280	349	139.6	1,329	696	278.4
Pend Oreille	1993	78	720	18.0	212	1,049	419.6	0	0	0.0
	1992	0	0	0.0	32	86	34.4	0	0	0.0
Priest Lake	1993	0	0	0.0	4	6	2.4	0	0	0.0
	1992	0	0	0.0	6	16	6.4	0	0	0.0
West St. Joe	1993	74	400	10.0	464	2,035	814.0	0	0	0.0
	1992	0	0	0.0	170	899	359.6	0	0	0.0
Coeur d'AleneIR	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	78	335	134.0	0	0	0.0
Nez Perce IR	1993	0	0	0.0	949	814	325.6	0	0	0.0
	1992	0	0	0.0	26	122	48.8	0	0	0.0
North Idaho Totals	**1993**	**859**	**7,542**	**188.6**	**3,882**	**13,353**	**5,341.2**	**112**	**78**	**31.2**
	1992	2	15	0.4	1,734	4,819	1,927.6	1,576	951	380.4

* Clearwater-Potlatch Timber Protective Association.

Table 2b. Idaho Statewide summary; annual bark beetle mortality by reporting area: **Southern Idaho.**

		Pine Engraver Beetle Estimated Mortality			**Western Pine Beetle** Estimated Mortality			**Spruce Beetle** Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Boise	1993	2,300	3,375	33.8	6,900	10,125	5,568.8	500	500	239.0
	1992	606	585	5.9	5,455	5,263	2,894.7	571	141	67.4
Caribou	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
Challis	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
Payette	1993	425	750	7.5	1,275	2,250	1,237.5	35,600	35,200	16,825.6
	1992	220	277	2.8	1,979	2,493	1,371.2	31,155	31,719	15,161.7
Salmon	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	60	84	40.2
Sawtooth	1993	475	500	5.0	1,425	1,500	825.0	0	0	0.0
	1992	58	25	0.3	518	224	123.2	10	14	6.7
Targhee	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	20	28	13.4
Indian Res.	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
State Lands	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
BLM	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
Other	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
South Idaho Totals	1993	3,200	4,625	46.3	9,600	13,875	7,631.3	36,100	35,700	17,064.6
	1992	884	887	9.0	7,952	7,980	4,389.1	31,816	31,986	15,289.4
State Totals	**1993**	**4,059**	**12,167**	**234.9**	**13,482**	**27,228**	**12,972.5**	**36,212**	**35,778**	**17,095.8**
	1992	886	902	9.4	9,686	12,799	6,316.7	33,392	32,937	15,669.8



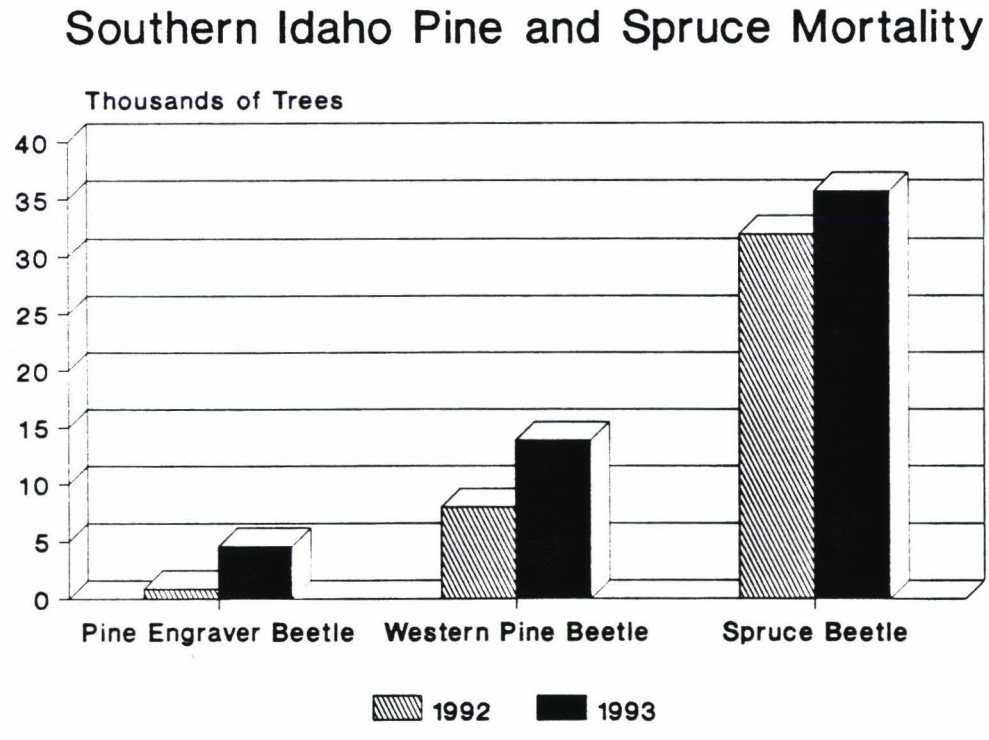


Figure 2. Northern and Southern Idaho
Pine and Spruce Mortality
by Bark Beetle Species 1992 - 1993

Table 3. Estimated spruce beetle caused mortality, 1985 - 1993

		ESTIMATED MORTALITY		
Forest and Adjacent Lands	YEAR	Acres Infested	Trees	MBF Volume
Boise	1985	55	84	40.2
	1986	--	1,095	523.4
	1987	607	669	319.8
	1988	155	254	121.4
	1989	175	227	108.5
	1990	100	40	19.1
	1991	0	0	0.0
	1992	571	141	67.4
	1993	500	500	239.0
Payette	1985	3,881	13,775	6,584.4
	1986	--	12,600	6,022.8
	1987	13,002	15,873	7,587.3
	1988	36,364	44,756	21,393.4
	1989	26,451	32,108	15,347.6
	1990	152,810	185,460	88,649.9
	1991	36,100	23,800	11,376.4
	1992	31,155	31,719	15,161.7
	1993	35,600	35,200	16,825.6
Totals	**1985-1993**	**337,526**	**398,301**	**190,387.9**

DOUGLAS-FIR BEETLE

In northern Idaho, Douglas-fir beetle populations decreased dramatically from 1992 to 1993. An estimated 7,000 trees on just over 2,000 acres were infested this year compared to nearly 30,000 trees on almost 15,000 acres in 1992 (Table 4a, Figure 3). Douglas-fir beetle outbreaks are triggered by large amounts of blowdown and usually only last a couple of years. Most of the detected activity was in small scattered groups. Ground surveys conducted on the Palouse RD, Clearwater NF and on the Salmon River RD, Nez Perce NF indicate a few still active populations but a declining trend overall.

Mortality decreased in southern Idaho. Approximately 89,900 trees were killed in 1993 compared to 105,500 trees killed in 1992 (Table 4b, Figure 3). The largest infestations were located on the Boise, Caribou, Payette, and Sawtooth NF"s. Smaller infestations were located on the Challis, Salmon, and Targhee NF's. A static or decreasing mortality trend was observed throughout Forests in southern Idaho.

FIR ENGRAVER

Fir engraver killed trees in northern Idaho were down in 1993, dropping from 14,798 in 1992 to 9,462 (Table 4a, Fig. 3). The greatest activity was in the Nez Perce NF where 3,740 faded or red trees were recorded this year. Even in this area the trend is down. It is interesting to note that the majority of the fir engraver activity on the Nez Perce NF occurred in the area where the western spruce budworm has defoliated trees for several years.

The areas around Coeur d'Alene, St. Maries, and in the Craig Mountains have also had extensive tree killing by the fir engraver. The Coeur d'Alene and St. Joe (St. Maries) areas are known for their generally high infection levels of root diseases. The beetle attacks in these areas are likely associated with root disease centers where the beetles make successful attacks in the weakened trees.

True fir mortality from fir engraver attack increased in southern Idaho from 41,900 trees in 1992 to 67,200 trees in 1993 (Table 4b, Figure 3). All activity was located on the Boise and Payette NF's.

WESTERN BALSAM BARK BEETLE

Mortality attributed to the western balsam bark beetle increased slightly in northern Idaho in 1993 (Table 4a, Figure 3). Nearly 4,700 faded subalpine fir were detected on about 5,000 acres. Most of the activity is located on the IPNF's and Nez Perce NF. Western balsam bark beetle activity is often associated with root disease in mature, dense subalpine fir stands.

Pheromone traps were deployed in the Trout Creek drainage of the Bonners Ferry RD to monitor the flight period of the beetle. Traps were placed on May 27 and beetles were caught from June 4 - Sept. 30. Peak flight occurred between June 14-23 and July 22-29. Because of the abnormal weather in 1993, the traps will be monitored again in 1994.

Western balsam bark beetle was the most widespread insect pest observed in southern Idaho in 1993 (Table 4b, Figure 3), with mortality present on all National Forests in southern Idaho. The largest infestations were present on the Caribou, Sawtooth, and Targhee NF's. Smaller infestations were present on the Boise, Challis, Payette, and Salmon NF's. Increases in activity occurred on all National Forests in southern Idaho except the Targhee NF where a significant decrease in activity was observed.

Table 4a. Idaho Statewide summary; annual bark beetle mortality by reporting area: **Northern Idaho.**

		Douglas-Fir Beetle Estimated Mortality			**Fir Engraver Beetle** Estimated Mortality			**Western Balsam Bark Beetle** Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Bitterroot	1993	206	558	195.3	0	0	0.0	6	12	1.3
	1992	1,032	4,443	1,555.0	0	0	0.0	2	2	0.2
Cataldo	1993	39	107	37.4	64	291	58.2	33	75	8.3
	1992	69	210	73.5	83	187	37.4	6	8	0.9
Clearwater	1993	103	488	170.8	116	282	56.4	520	460	50.6
	1992	2,215	5,049	1,767.1	306	458	91.6	606	835	91.8
CPTPA*	1993	263	1,095	383.3	107	390	78.0	14	110	12.1
	1992	196	566	198.1	292	987	197.4	0	0	0.0
Craig Mtns.	1993	109	570	199.5	419	830	166.0	0	0	0.0
	1992	473	705	246.7	857	1,813	362.6	0	0	0.0
Panhandle	1993	384	1,545	540.8	544	952	190.4	3,448	2,468	271.5
	1992	2,691	5,249	1,837.1	2,644	2,594	518.8	1,916	2,335	256.9
Kendrick	1993	250	990	346.5	142	455	91.0	0	0	0.0
	1992	537	2,555	894.3	190	690	138.0	0	0	0.0
Kootenai Valley	1993	6	9	3.1	6	12	2.4	18	15	1.6
	1992	12	10	3.5	23	13	2.6	0	0	0.0
Maggie Creek	1993	18	60	21.0	54	98	19.6	0	0	0.0
	1992	42	104	36.4	996	571	114.2	32	65	7.2
Mica	1993	25	105	36.8	344	1,180	236.0	0	0	0.0
	1992	51	190	66.5	495	669	133.8	0	0	0.0
Nez Perce	1993	522	821	287.3	4,342	3,741	748.2	941	1,105	121.5
	1992	6,967	8,468	2,963.8	7,465	4,710	942.0	795	845	93.0
Pend Oreille	1993	8	18	6.3	38	91	18.2	0	0	0.0
	1992	62	165	57.7	28	62	12.4	8	32	3.5
Priest Lake	1993	59	295	103.3	4	10	2.0	105	448	49.3
	1992	10	45	15.7	24	55	11.0	50	270	29.7
West St. Joe	1993	143	525	183.8	264	1,115	223.0	0	0	0.0
	1992	226	875	306.3	218	895	179.0	2	5	0.6
Coeur d'AleneIR	1993	0	0	0.0	0	0	0.0	0	0	0.0
	1992	8	40	14.0	34	130	26.0	0	0	0.0
Nez Perce IR	1993	9	35	12.3	6	15	3.0	0	0	0.0
	1992	229	921	322.3	338	964	192.8	0	0	0.0
North Idaho Totals	**1993**	**2,144**	**7,221**	**2,527.3**	**6,450**	**9,462**	**1,892.4**	**5,085**	**4,693**	**516.2**
	1992	14,820	29,595	10,358.0	13,993	14,798	2,959.6	3,417	4,397	483.8

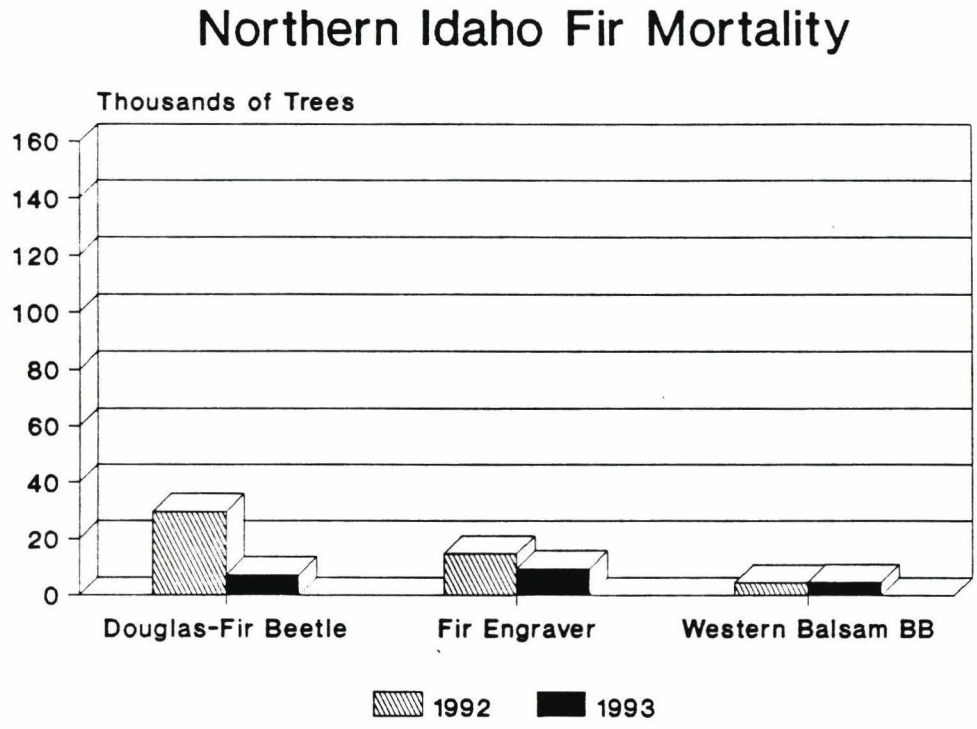
* Clearwater-Potlatch Timber Protective Association

Table 4b. Idaho Statewide summary; annual bark beetle mortality by reporting area: Southern Idaho.

		Douglas-Fir Beetle Estimated Mortality			Fir Engraver Beetle Estimated Mortality			Western Balsam Bark Beetle Estimated Mortality		
AREA	Year	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume	Acres Infested	Trees	MBF Volume
Boise	1993	43,300	37,900	5,381.0	31,100	65,700	12,483.0	12,300	9,600	1,056.0
	1992	51,602	34,853	4,949.1	23,907	41,869	7,955.1	4,511	3,541	389.5
Caribou	1993	3,400	4,500	639.0	0	0	0.0	15,700	29,900	3,289.0
	1992	4,974	8,044	1,142.2	5	5	0.9	20	50	5.5
Challis	1993	500	900	127.8	0	0	0.0	3,900	8,300	913.0
	1992	560	906	128.7	0	0	0.0	2,050	2,361	259.7
Payette	1993	17,800	16,700	2,371.4	1,800	1,500	285.0	1,900	1,800	198.0
	1992	14,839	15,781	2,240.9	35	35	6.7	0	0	0.0
Salmon	1993	800	1,400	198.8	0	0	0.0	700	1,900	209.0
	1992	6,936	8,703	1,235.8	0	0	0.0	480	430	47.3
Sawtooth	1993	10,000	22,000	3,124.0	0	0	0.0	22,700	45,000	4,950.0
	1992	14,242	31,305	4,445.3	0	0	0.0	17,040	25,229	2,775.2
Targhee	1993	1,300	2,500	355.0	0	0	0.0	12,500	21,600	2,376.0
	1992	6,532	5,900	837.8	0	0	0.0	34,545	48,783	5,366.1
Indian Res.	1993	100	100	14.2	0	0	0.0	3,700	5,100	561.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
State Lands	1993	600	500	71.0	0	0	0.0	1,000	2,000	220.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
BLM	1993	300	300	42.6	0	0	0.0	500	400	44.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
Other	1993	2,100	3,100	440.2	0	0	0.0	20,600	20,600	2,266.0
	1992	0	0	0.0	0	0	0.0	0	0	0.0
South Idaho Totals	1993	80,200	89,900	12,765.8	32,900	67,200	12,768.0	95,500	146,200	16,082.0
	1992	99,685	105,492	14,979.8	23,947	41,909	7,962.7	58,646	80,394	8,843.3
State Totals	**1993**	**82,344**	**97,121**	**15,293.1**	**39,350**	**76,662**	**14,660.4**	**100,585**	**150,893**	**16,598.2**
	1992	114,505	135,087	25,337.8	37,940	56,707	10,922.3	62,063	84,791	9,327.1

RED TURPENTINE BEETLE

Red turpentine beetles continued to attack recently pruned western white pine trees that were about 2-6 inches in diameter. Attacks have been found on the Palouse RD, Clearwater NF, and on the Fernan RD, IPNF's. In a plantation on the Palouse RD, where 41 per cent of the trees were attacked in 1992, 27 per cent had new attacks in 1993. Mortality fell from 10 per cent in 1992 to 3.5 per cent in 1993. In 5 plantations recently pruned on the Fernan RD, beetle attacks were found in 2-9 per cent of the trees and no mortality was noted. Attacked trees there averaged from 1.3 to 3.3 inches in diameter. Plans are to continue surveying recently pruned white pine stands to determine the extent of the problem.



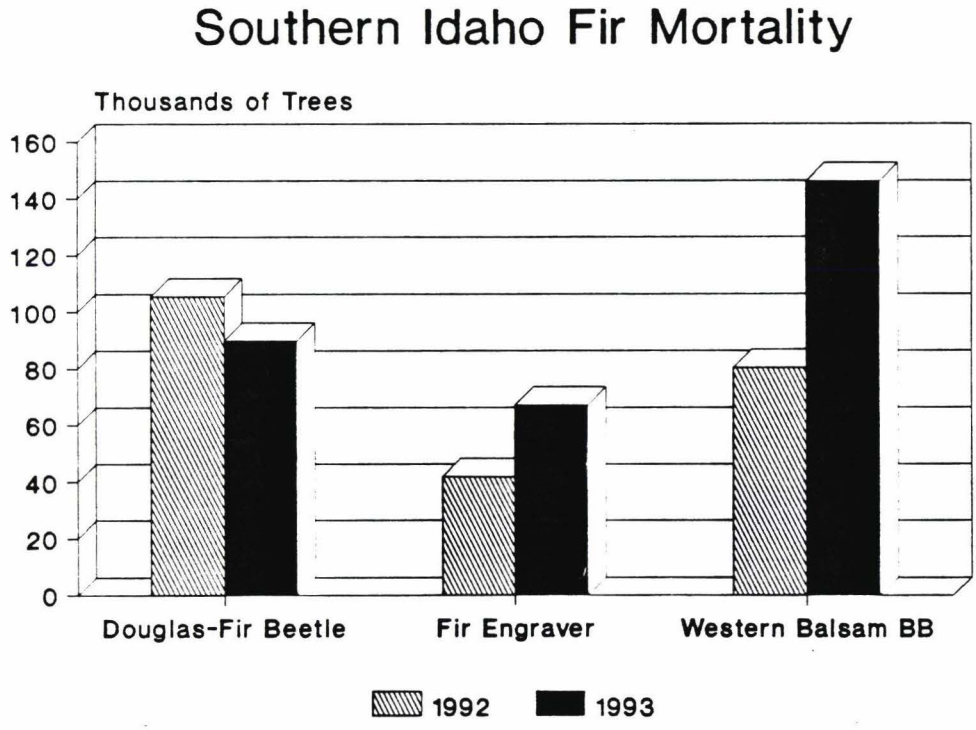


Figure 3. Northern and Southern Idaho
Fir Mortality
by Bark Beetle Species 1992 - 1993

DEFOLIATORS

DOUGLAS-FIR TUSSOCK MOTH

There continues to be no visible defoliation due to the Douglas-fir tussock moth in the forested areas of northern Idaho. Last report of defoliation was in 1986. The pheromone trapping detection surveys were conducted and trap counts were in general very low (Table 6, Figure 5), with a decrease in the overall trap catches. Trap counts haven't been this low since Mount St. Helens erupted in 1980. Larval populations from lower crown sampling, taken in the spring, were at the lowest counts in ten years, with only one larva found. The comparison from 92-93 are like night and day. With the trap information from 1992, we were expecting the upward trend to continue in both the trap catches and larval counts. It did just the opposite, with almost nothing being caught or found. We did get however, quite a number of reports from rural and urban landowners concerning the Douglas-fir tussock moth defoliating their ornamental fir and spruce.

During 1993, Douglas-fir tussock moth populations collapsed and no current defoliation was observed in all of southern Idaho (Table 5a, Figure 6).

WESTERN SPRUCE BUDWORM

In northern Idaho, defoliation on the Nez Perce NF decreased dramatically from nearly 58,000 acres in 1992 to only 730 acres in 1993 (Table 5b, Figure 4). All acres detected from the air in 1993 were classified as light and were new areas located on the Red River and Elk City RD's.

Defoliation that was so heavy on the Salmon River RD over the past few years was virtually nonexistent in 1993. Pheromone trap catches in 16 areas on the Salmon River RD were extremely low with only 6 sites having positive trap catches and only 1 or 2 moths caught at any one site. Larvae were collected and reared in the lab to determine percent parasitism. Larvae reared from Graves Saddle and Seven Devils (areas heavily defoliated in 1992) had 43-50 per cent parasitism. However, the sample size was small because few larvae were found. Larvae reared from Squaw Saddle and surrounding areas, which were lightly defoliated, had 35 per cent parasitism in early larval collections and 19 per cent parasitism in larvae collected later in the summer. Populations are expected to stay low in 1994 on the Salmon River RD but may be building in the newly defoliated areas on the Red River and Elk City RD's.

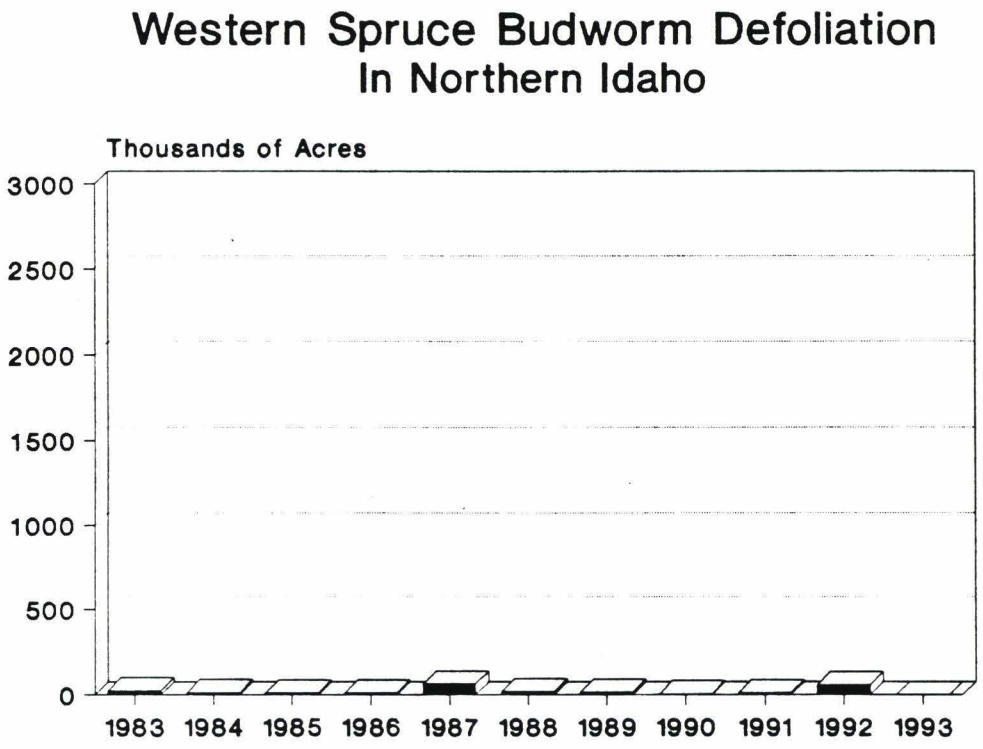
In southern Idaho there were only 225 acres of light defoliation observed on the Challis NF (Table 5b, Figure 4).

Table 5a. Acres of **DOUGLAS-FIR TUSSOCK MOTH** defoliation as determined by aerial surveys

		Defoliation Intensity				
Forest and Adjacent Lands	Year	Light	Moderate	Heavy	Total	Change
Boise	**1993**	**0**	**0**	**0**	**0**	**-231,100**
	1992	28,700	47,900	154,500	231,100	
Payette	**1993**	**0**	**0**	**0**	**0**	**-48,500**
	1992	19,400	22,700	6,400	48,500	
Sawtooth	**1993**	**0**	**0**	**0**	**0**	**-123,400**
	1992	19,000	15,200	89,200	123,400	
Owyhee Mtns.	**1993**	**0**	**0**	**0**	**0**	**-15,000**
	1992	0	0	15,000	15,000	
Total	**1993**	**0**	**0**	**0**	**0**	**-418,000**
	1992	67,100	85,800	265,100	418,000	

Table 5b. Acres of **WESTERN SPRUCE BUDWORM** defoliation as determined by aerial surveys.

		Defoliation Intensity				
Forest and Adjacent Lands	Year	Light	Moderate	Heavy	Total	Change
Challis	**1993**	**225**	**0**	**0**	**225**	**-3,675**
	1992	3,300	600	0	3,900	
Nez Perce	**1993**	**729**	**0**	**0**	**729**	**-57,081**
	1992	26,967	1,330	29,513	57,810	
Salmon	**1993**	**0**	**0**	**0**	**0**	**-28,100**
	1992	18,900	7,600	1,600	28,100	
Targhee	**1993**	**0**	**0**	**0**	**0**	**-0**
	1992	0	0	0	0	
Total	**1993**	**954**	**0**	**0**	**954**	**-89,081**
	1992	49,167	9,530	31,113	88,856	



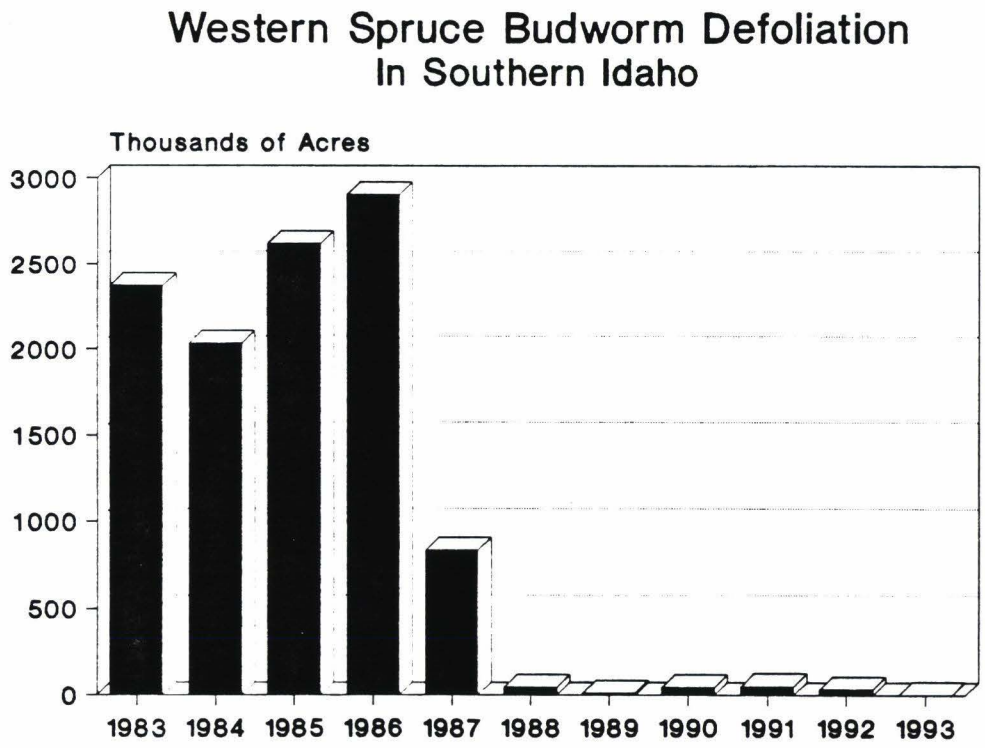


Figure 4. Acres of Western Spruce Budworm defoliation as determined by Aerial Surveys in Northern and Southern Idaho 1983 - 1993

Douglas-Fir Tussock Moth

Table 6. Means of average moth catch per 5 pheromone trap/sample plots in Idaho, **1993-1983**

AREA	Number of 1993 sample plots	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983
STATE AND PRIVATE												
Coeur d'Alene	5	0.0	0.1	0.0	*	*	*	*	*	*	*	*
Coeur d'Alene	5	0.0	0.1	0.1	7.2	0.0	0.0	0.2	8.1	9.2	4.7	3.6
Plummer-Moscow	13	0.0	0.7	0.1	0.1	0.0	0.1	1.3	25.6	59.9	18.8	13.8
Plummer-Moscow	17	0.0	0.5	0.1	0.1	0.0	0.0	0.3	15.2	43.3	7.0	3.3
Plummer-Moscow	8	0.0	0.5	0.0	0.1	0.0	0.0	0.5	14.6	32.6	9.0	4.3
Plummer-Moscow	1	0.0	4.0	0.0	0.0	0.0	0.0	1.0	42.8	68.4	36.4	*
Plummer-Moscow	2	0.0	0.2	0.0	0.0	0.0	0.0	3.8	49.7	76.0	*	*
Plummer-Moscow	3	0.0	1.6	0.1	0.1	0.0	0.2	9.0	80.5	*	*	*
Plummer-Moscow	14	0.0	0.1	0.1	0.2	0.0	0.1	2.2	*	*	*	*
Craig Mountain	8	0.05	0.5	0.0	0.2	0.0	0.0	0.1	3.5	0.4	0.6	0.5
NEZ PERCE NF												
Selway RD	5	0.04	0.1	0.0	0.4	0.1	0.2	0.0	0.1	0.0	0.1	0.1
Salmon River RD	5	0.08	0.7	2.5	0.1	0.0	0.0	0.0	0.9	0.3	0.7	1.9
CLEARWATER NF												
Lochsa RD	2	0.1	0.2	1.2	0.0	0.2	0.0	0.0	0.3	0.0	0.0	0.0
Canyon RD	5	0.0	0.1	0.3	0.2	0.0	0.0	0.0	1.7	0.9	*	*
Pierce RD	5	0.16	0.3	0.6	0.3	0.0	0.1	0.1	4.0	0.6	0.1	0.1
BOISE NF												
Mountain Home RD	2	0.0	32.2	68.9	5.3	0.2	0.6	1.4	1.2	0.0	0.4	21.7
Boise RD	3	0.0	23.5	59.6	65.6	*	*	*	*	*	*	*
Idaho City RD	4	0.0	0.6	27.2	*	*	*	*	*	*	*	*
Cascade RD	5	0.0	0.4	0.7	31.6	0.0	0.2	0.2	1.2	1.0	0.0	20.0
Lowman RD	11	0.0	1.8	20.0	*	*	*	*	*	*	*	*
Emmett RD	10	0.02	1.2	19.7	*	*	*	*	*	*	*	*
PAYETTE NF												
Council RD	11	0.0	2.8	6.6	23.2	0.7	1.9	7.4	21.2	5.1	6.7	38.2
Weiser RD	11	0.0	2.4	21.4	67.0	0.8	0.7	5.2	15.2	4.1	8.1	42.1
New Meadows RD	12	0.0	1.6	8.8	*	*	*	*	*	*	*	*
McCall Rd	5	0.0	0.8	0.7	*	*	*	*	*	*	*	*
SALMON NF												
Northfork RD	*	*	*	*	0.4	0.6	21.3	2.9	6.6	*	1.9	38.7
SAWTOOTH NF												
Fairfield RD	5	0.0	35.3	70.5	80.3	16.5	3.3	13.3	19.7	0.0	6.3	20.3
OTHER												
Owyhee Mountains	3	0.0	51.1	76.1	75.5	12.8	15.8	7.8	9.4	0.6	10.8	*
Sharps Canyon	1	0.0	18.8	*	53.2	9.2	36.4	8.4	22.6	5.2	1.3	41.2
Pine Rdg-Lost Lake	1	0.0	5.0	25.0	*	*	*	*	*	*	*	*

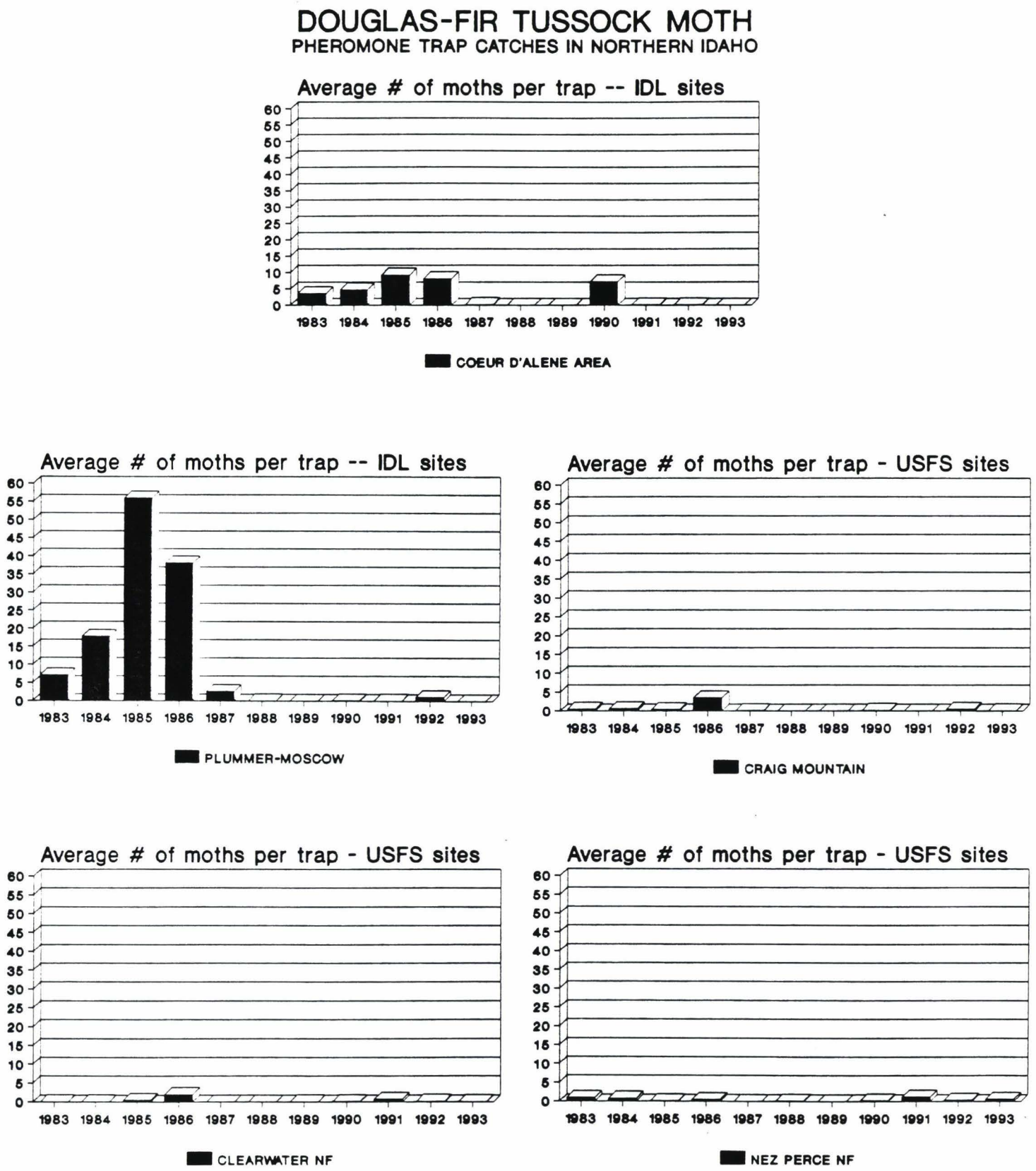

DOUGLAS-FIR TUSSOCK MOTH
PHEROMONE TRAP CATCHES IN NORTHERN IDAHO
Average # of moths per trap -- IDL sites
60
55
50
45
40
35
30
25
20
15
10
5
0
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993
COEUR D'ALENE AREA
Average # of moths per trap -- IDL sites
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993
PLUMMER-MOSCOW
Average # of moths per trap - USFS sites
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993
CRAIG MOUNTAIN
Average # of moths per trap - USFS sites
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993
CLEARWATER NF
Average # of moths per trap - USFS sites
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993
NEZ PERCE NF

Figure 5. USFS and IDL
Douglas-fir Tussock Moth Trap Catches
in Northern Idaho 1983 - 1993

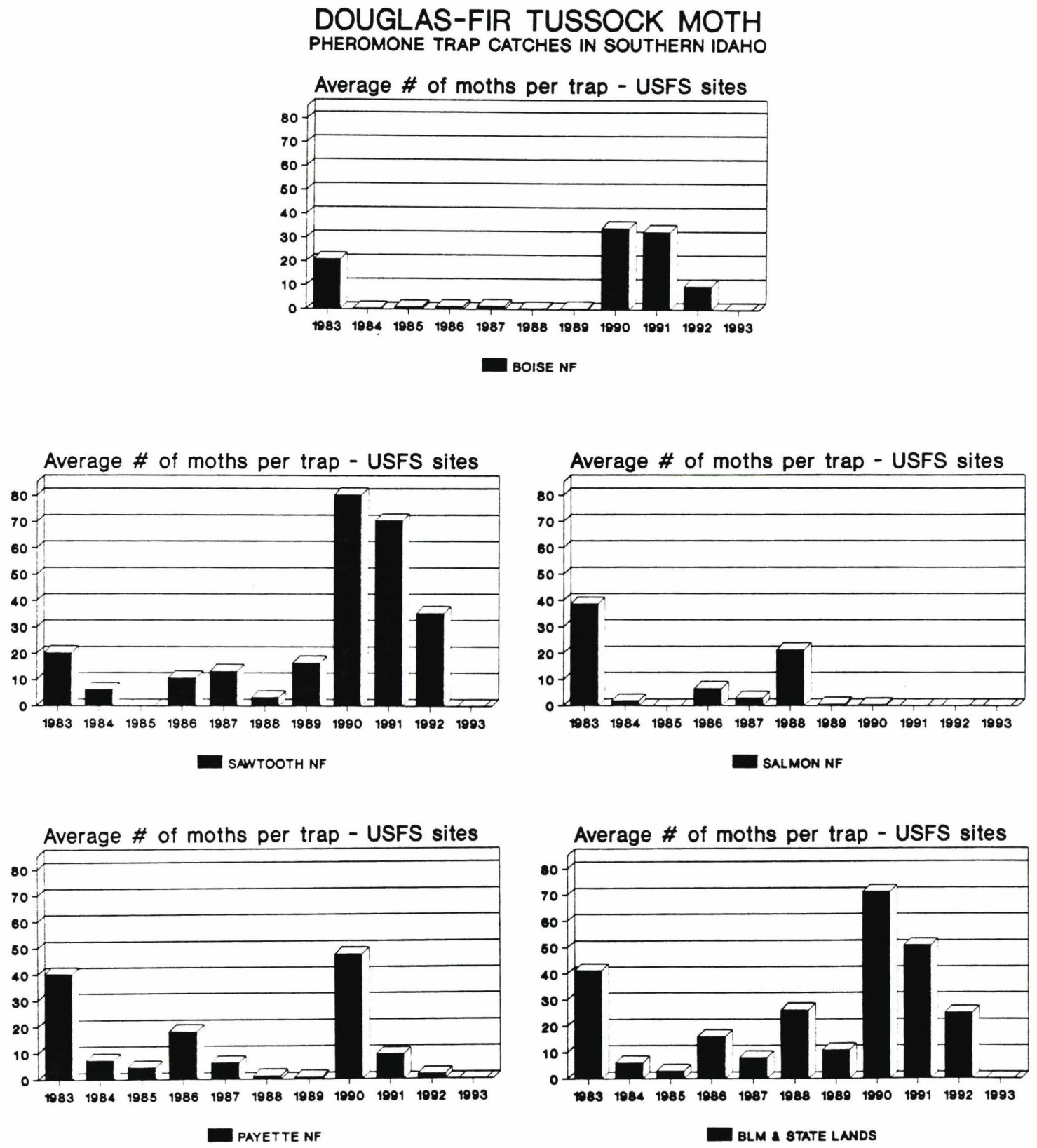


Figure 6. USFS
Douglas-fir Tussock Moth Trap Catches
in Southern Idaho 1983 -1993

GYPSY MOTH

The Idaho gypsy moth detection survey program systematically samples all populated areas of the state in order to detect introductions of gypsy moths. Many US Forest Service campgrounds are also sampled, as well as rest stops, tourist attraction sites and other locations where people congregate. High risk areas, those cities with the highest populations and the highest potential for newly arriving families, are trapped each year. Other areas are trapped ever other year or every third year. A total of 4429 traps were placed throughout Idaho in 1993. The survey will continue to expand as the rural/urban interface develops and more people move into the rural areas of the state.

Detection trapping: The Idaho Department of Lands, the Idaho Department of Agriculture and the U.S. Forest Service Regions 1 and 4, with participation from APHIS, cooperatively placed 4314 pheromone baited detection traps throughout the state in 1993. Our target density for these detection traps is 4 traps per square mile. Added emphasis is given to cities, towns and rural areas where a sufficient number of new families moved in to generate an increased risk of introduction of gypsy moths. Tracking of these new "move-ins" is provided in a report compiled by the Idaho Department of Transportation showing the locations of people moving to Idaho from gypsy moth infested states. The report, derived from applications for vehicle title transfers, indicates that approximately 250 individuals or families move to Idaho each month from the generally infested states of the Northeast and Virginia, West Virginia and Wisconsin. Utah has now been dropped from our list.

Two gypsy moths were caught in Idaho in 1993, both in one trap on the east side of Coeur d'Alene, Kootenai County (Figure 7). The area has no residences, but does have several motels and RV Parks in the vicinity. This area will be intensively trapped in 1994.

Delimitation trapping: One hundred fifteen delimitation traps at 36 traps per square mile, were placed in areas surrounding the three 1992 detection catch sites and at the Coeur d'Alene site where the moths were caught in 1993. The 1992 traps caught three moths in widely separated areas of the state, one at Pinehurst, Shoshone County 30 miles east of Coeur d'Alene, one at Filer, Twin Falls County in south-central Idaho and one near the eastern edge of the state at Shelly, Bingham County. The Pinehurst site had a single moth in both 1991 and 1992. No moths were caught at these threes sites in 1993 and no additional moths were caught in Coeur d'Alene.

Previous infestations: Eradication of previous infestations of gypsy moths in Sandpoint, Bonner County and in Coeur d'Alene, Kootenai County, has now been confirmed for four years. No moths were caught in the areas of concern in 1990, 1991, 1992 or 1993 after treatments in 1989 and 1990 with *Bacillus thuringiensis*.

State advisory committee: An advisory committee, composed of representatives from the above mentioned agencies and the University of Idaho, provides guidelines for the gypsy moth program in Idaho.

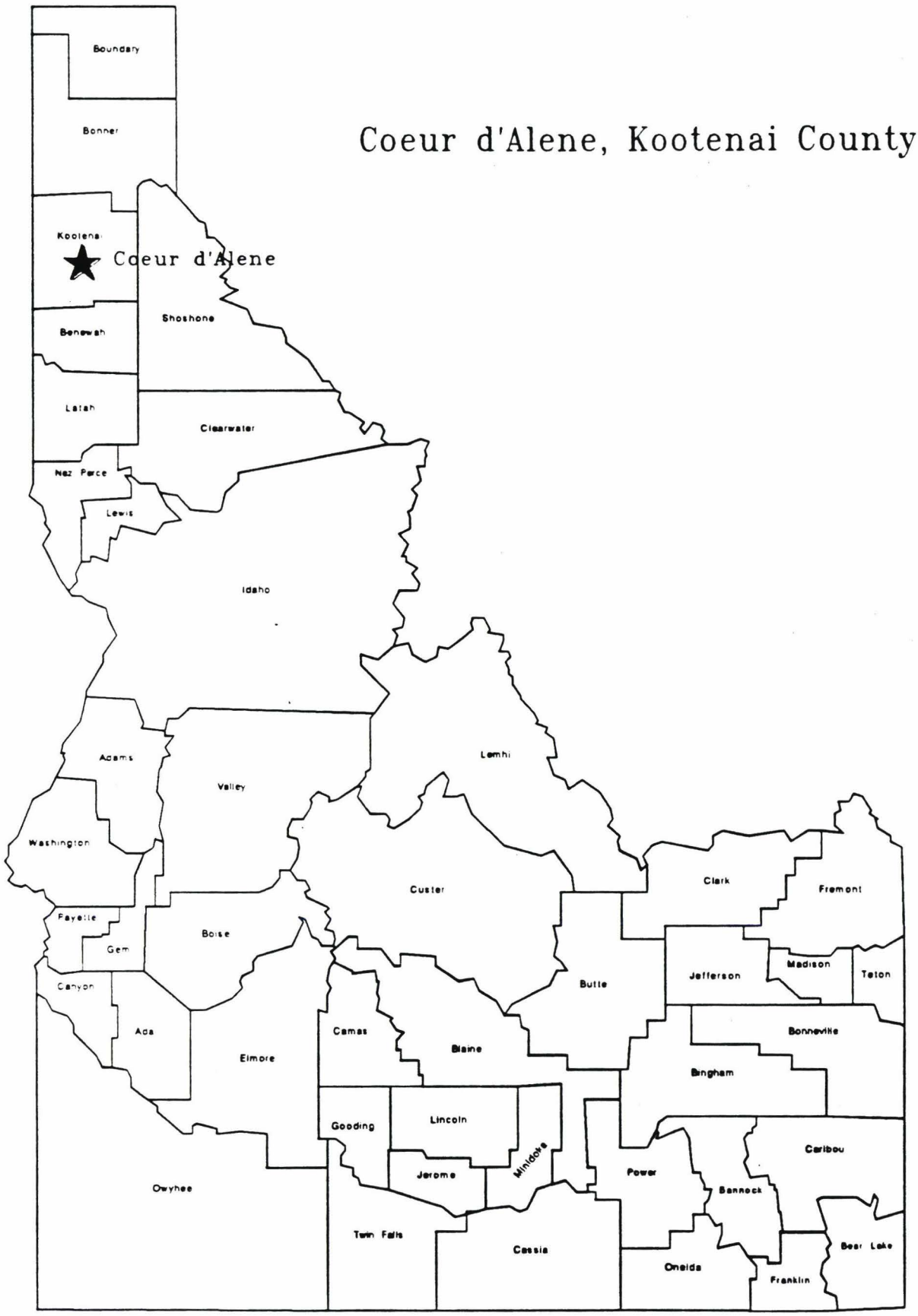


Figure 7. State of Idaho
1993 Gypsy Moth Catch Sites

OTHER INSECTS

BALSAM WOOLLY ADELGID

Balsam woolly adelgid populations continue to increase over that of last year. The trends show that the adelgid populations have been on an upward swing over the past few years. Therefore, the adelgid has and continues to pose a threat to true firs throughout northern Idaho. With the extremely mild winters since 90/91, tree mortality has been on a steady increase over these past few years.

Aerial surveys detected around 8,000 acres of dead and fading subalpine fir in 1993 as compared to 17,000 acres in 1992. The acres are lower because some of the areas with known adelgid populations were not flown on the Clearwater and Nez Perce NF's. Ground surveys show a high and healthy adelgid population in most areas. Numerous other areas have infested trees that are not yet showing symptoms from the air. Most of the damage is still occurring on the southern end of the Idaho Panhandle NF and on the Clearwater and Nez Perce NF's and on adjacent state and private lands. Mortality is still occurring on private lands in the Craig Mountains south of Lewiston and in the Joseph Plains area south of the Salmon River. Tree mortality continues to be confined to subalpine fir, although bole infestations are still occurring on grand fir of all ages. The heavy gouting, then killing of true fir regeneration located adjacent to infested subalpine fir, has taken a heavy toll. In many of the areas this insect has killed 75 per cent or more of the true fir regeneration.

CRANBERRY GIRDLER MOTH

Cranberry girdler moths were caught in pheromone traps at the Coeur d'Alene nursery from June 16 through Sept. 17. Peak flight occurred before June 23 when 807 moths were caught. This occurred a few days earlier than in 1992. The nursery beds were sprayed with one application of diazinon, aimed at adults on June 29-30. One application of Dursban, aimed at larvae in the soil, was applied in August. Out of 7,350 2-0 Douglas-fir seedlings examined in the November lift, only 5 (<1%) had damage that may have been caused by larval feeding.

TERMINAL WEEVILS

As part of an on going lodgepole pine terminal weevil incidence survey, 6 young lodgepole pine stands were evaluated on the Priest Lake RD, IPNF's. The stands were from 5 to 25 years old at a variety of elevations. Infestation level for 1993 ranged from a low of 4 per cent in a 5 year old stand to a high of 31 per cent in a 12-year old stand. Current as well as previous years damage was evident in all of the stands. Terminal weevils kill the terminals and sometimes laterals of their host trees causing stem deformities and growth loss. The survey is being conducted in Montana and other districts in Idaho as well as to represent a wide variety of conditions and incidence levels. It will eventually lead to the development of a hazard rating system or management strategies, such as delaying thinning, to reduce the impact of the weevil.

PINE NEEDLE SHEATH MINER

The pine needle sheath miner caused light to medium damage to stands of both lodgepole and ponderosa pine throughout northern Idaho in 1992. In 1993, the population collapsed with no observation of feeding activity.

RUSTY TUSSOCK MOTH

Outbreak populations of the rusty tussock moth were found in many areas of northern Idaho in 1992. With the 1993 field season at an end, so is the rusty tussock moth. The 1992 populations have completely crashed. There were no reports of any observations of rusty tussock moth in 1993.

CONE AND SEED INSECTS

Cone and seed insects are becoming of ever increasing importance in the intermountain area, primarily due to the value of the blister rust-resistant white pine seed being produced throughout the region. The main insects of concern are the western conifer seed bug, the lodgepole cone moth and the fir cone worm, all of which infest western white pine cones.

The western conifer seed bug was commonly seen throughout northern Idaho in 1993. In addition to finding them in the seed orchards, there were many reports received from the general public, especially in the fall when the adults began searching for overwintering sites and they began moving into houses. Seedbugs were again the most abundant pest in the Coeur d'Alene western white pine seed orchard. Seedbug adults were first observed mating in the orchard on June 1. By July 6, many adults and nymphs were found. Spraying the orchard with Pounce®, a synthetic pyrethroid, was delayed until July 26-27 because of the possibility of adverse affects of Pounce on developing cone flowers and because of rainy weather. Only a few adults were found on border trees (those not sprayed) after treatment. Other minor insects found on cones were adelgids, and coneworms. A total of 1,536 bushels of cones were harvested yielding 915 pounds of seed. This was a record harvest.

At Lone Mountain the cone crop was low and a small number of adelgids and one seedbug adult were observed. Twenty three bushels of cones were harvested.

The only cone and seed insects found at Grouse Creek were adelgids. However, several trees had large populations of giant conifer aphids on their stems early in the season. These were gone by mid-summer, probably due to natural mortality caused by parasites and predators. One tree was defoliated by web-spinning sawflies.

The Priest River Experimental Forest white pine seed orchard had a small cone crop and very few were damaged by coneworms. Coneworm populations had been high there over the past few years. A black light trap deployed over the summer failed to catch any coneworm adults. This may be due to the low population and/or adverse weather. The light trap will be tested again in 1994 to see if it can be used to monitor coneworm populations.

At the Moscow white pine seed orchard, pheromone traps and visual inspections were used to monitor the presence of the lodgepole cone moth and the western conifer seed bug. The fir cone worm has caused considerable damage to the cones and seeds in previous years at this orchard. In the absence of a reliable monitoring tool for this insect, pheromone traps baited to catch the lodgepole cone moth were deployed throughout the orchard. The emergence of the lodgepole cone worm has served as the key for timing of pesticide sprays aimed at control of the fir cone worm. The traps were set out on March 25. Most moths were caught near the end of April, and on May 12 the orchard was treated with esfenvalerate (Asana®), a synthetic pyrethroid.

Monitoring for the western conifer seedbug at the Moscow orchard began in June using binoculars and a compact but powerful telescope. Seedbugs were seen in late July and in August and the decision was made to treat, using Asana, to protect the developing conelets. The spray took place the evening of August 27. The first treatment appeared to have substantially reduced the number of coneworms infesting the cones. A visual inspection in the shed at the orchard revealed virtually no boring frass. As the cones were being transported to Lewiston for drying, no larvae emerged out of the cones. On the same trip in 1992 so many larvae crawling out of the cones that they covered the inside of the van. It is also anticipated that the second spray reduced the seedbug population and provided the needed protection. There were a very high number of conelets on the trees at the end of the summer season. A total of 275 bushels of cones were collected in 1993. This is the second consecutive year that the harvest has been low.

Several trees had cones this year at the Dry Creek Douglas-fir seed orchard. Minor pests included adelgids, a conifer-aspen rust on some of the cones. Their affect on the cones is unknown although the botrytis is a nursery pathogen. Cooley spruce gall adelgid was the common cause some yellowing of new shoots. The fungus caused die back on several branch tips.

The BLM ponderosa pine seed orchard at Russell Bar experienced nearly 90 per cent loss of first year conelets in 1992. Large numbers of an insect in the family Reduviidae, identified by the National Museum as Zelus tetracanthus Stal, were found throughout the spring and summer of 1993. However, it is reported to be a predator and is not responsible for the cone damage. The loss of conelets may be due to lack of pollination.

TIP MOTHS

Damage from a ponderosa pine tip moth, was observed at the Lenore Tree Improvement Area, Clearwater NF from 1991 to 1993. Tip moth larvae infest shoots of young pine trees resulting in terminal growth loss and stem deformities. The plantation was treated with two applications of carbaryl in March and April 1993. Terminal infestation levels dropped from 7 per cent in 1992 to 1.5 per cent in 1993. Infestation levels in the laterals is still high. Control of tip moths in the plantation will be attempted with the use of pheromones in a mating disruption technique in 1994.

FOREST DISEASES

This narrative is divided into two sections. The first section describes diseases or disease problems which are known to have changed during 1993. Our most severe disease problems continue to cause widespread damage over much of the same areas every year.

The second section is a table which summarizes disease problems observed in 1993 with brief remarks describing hosts, location and severity.

STEM AND BRANCH DISEASES

DWARF MISTLETOES

Estimates for dwarf mistletoe indicate over 700,000 acres are infested with volume losses of over 13 million cubic feet. Dwarf mistletoe management considerations are generally included in Forest plans, and emphasize management through conventional forest management practices. However, there are still some previously harvested stands that qualify for sanitation treatment to eliminate residual infested trees that threaten the regeneration. Stand sanitation accomplishments for 1993 are reported in Table 7.

Table 7. - Dwarf Mistletoe Accomplishments - Southern Idaho 1993

National Forest	Treated Acres
Boise	1,090
Caribou	205
Challis	220
Payette	427
Salmon	50
Sawtooth	793
Total	2,785

ROOT DISEASES

Rough estimates indicate that root disease mortality occurs on nearly 2 millon acres of Idaho forests, causing losses of over 30 million cubic feet. Root diseases continue to be the primary disease concern throughout northern Idaho forests and are the subject of several studies. Please refer to the project summaries in the following pages for the current status of these projects.

VASCULAR WILTS

The City of Boise removed about 40 American elm trees that were infected with Dutch Elm disease from city property or right-of-way areas in 1993. About 1,300 elms remain out of the nearly 5,000 elm trees in the city 20-years ago when the disease was first diagnosed in Idaho. While elms comprise less than 8 per cent of the total trees of the Boise urban forest, their care, primarily because of spraying for elm leaf beetle, demands more than 25 per cent of the maintenance budget. Consequently, elms are not permitted for right-of-way plantings in the city.

FOLIAGE DISEASES

Foliage diseases caused the worst discoloration of southern Idaho forests since 1978 as well as continued damage of lodgepole pine throughout northern Idaho. Stands infected by several species of needle-cast fungi were most noticeable on several tree species in early June, as last years' compliment of needles turned reddish-brown. By mid-July, the elongation of the new needle flush of growth, and loss of the reddened, infected foliage, left the branches of many trees "lion-tailed" in appearance. This pre-mature casting of needles is likely to continue next year, as environmental conditions for fungal spore dispersal and infection (high humidity and cool temperatures) were present throughout most of the growing season in 1993.

Most of the damage in lodgepole pine was caused by the lodgepole pine needle cast fungus. Although widespread throughout the range of lodgepole pine in Idaho, the intensity of needle-cast infection on lodgepole pine stands was most severe in forests around Salmon, Soda Springs, and Cascade in southern Idaho and from Avery to Lookout Pass in northern Idaho.

Many areas have now suffered severe damage for three or four years, so we expect there may be growth losses related to these chronic infections. So far we have not seen much mortality in Idaho, but continued outbreaks will be monitored to detect mortality or increased bark beetle activity that might be associated with these weakened trees.

Elytroderma disease was widespread in ponderosa pine stands in southwestern Idaho. Areas of chronic severe infection occur around Cascade and Council, Idaho.

Diplodia blight of ponderosa pine continues to cause widespread dieback of foliage and small branches throughout much of northern Idaho. Infection intensities vary widely across this area and from tree to tree in any particular location.

Some larch stands in southwestern Idaho were completely defoliated, sometimes twice, by a combination of larch needle blight, and frost damage that corresponded with needle flush on these deciduous conifers.

Other needle diseases were not as widespread in northern Idaho, with only sporadic outbreaks observed.

ABIOTIC DAMAGE

HAIL DAMAGE

Severe hail damage was observed in large areas near the Priest River Experimental Forest. It affected many shrub species including devil's club, alder, ceanothus, and willow as well as most conifer tree species. Minor damage was also observed in isolated areas throughout north Idaho caused by a series of early spring thunderstorms.

Stunted growth, chlorosis, and mortality of nearly 700,000 1-0 Douglas-fir seedlings perplexed USDA Forest Service Lucky Peak Forest Nursery managers near Boise, Idaho. Over 300,000 of these seedlings died during the first week in August 1993. An intensive study, conducted by a multi-disciplinary team, attributed the damage to a variety of effects resulting from low soil pH, that has developed over the last 20-years, indicated the pH level in some nursery beds dropped from 6.9 to as low as 4.3 following sustained applications of acid-forming fertilizers and pesticides.

DISEASES OF NURSERIES AND TREE IMPROVEMENT AREAS

Botrytis cinerea caused unusually high levels of damage to container-grown western red cedar seedlings produced at the USDA Forest Service Nursery in Coeur d'Alene. Stock was especially damaged after being in cold storage during the winter. Western red cedar is very susceptible to this pathogen and care must be taken to reduce infection during production periods. Other than this disease, western red cedar seedlings are usually disease-free.

Fusarium acuminatum occurred at very high levels on whitebark pine seed, especially on selected lots from the Gallatin NF. This fungus may adversely affect seed germination and contribute to reduced seedling establishment.

Botrytis cinerea was more prevalent on nursery seedlings at several nurseries and even caused damage to large plantation trees at several sites in northern Idaho. This facultative parasite colonized necrotic tissues killed by other agents, especially unusually cold winter weather.

Pathogenic fungi located on Douglas-fir cones from the Dry Creek Tree Improvement site near Sandpoint included the rust Melampsora medusae and the common epiphyte Botrytis cinerea.

Sirococcus strobilinus was confirmed on necrotic branch tips of Douglas-fir trees at the Dry Creek Tree Improvement site near Sandpoint.

COMMON AND RECURRING NURSERY DISEASES

The most common and damaging diseases of conifer seedlings in nurseries in Idaho are root diseases caused by Fusarium spp. These fungi cause damping-off and root diseases on many different conifer hosts in bareroot and container nurseries. Damage is usually controlled in bareroot nurseries by soil fumigation.

The most common soil-borne pathogen species in bareroot nurseries is F. oxysporum, although several other species are commonly isolated from infested soil and diseased seedlings. Fusarium diseases in container nurseries are more difficult to control and often cause greater damage than in fumigated bareroot nurseries. The major pathogen in container nurseries is F. proliferatum, although F. oxysporum and several other fusaria may also occur at high levels in some nurseries. Although all conifer species are susceptible, most damage occurs on Douglas-fir, western larch, western white pine, and Engelmann spruce.

Cylindrocarpon spp. (especially C. destructans) continued to cause unacceptable losses to western white pine and whitebark pine seedlings at several nurseries. Damage to other conifer species also occurs, but root decay of five-needle pines is most serious. Control efforts to limit the amount of root decay have largely been unsuccessful.

Botrytis cinerea is a recurring problem on container western larch and Engelmann spruce seedlings. Western red cedar is also very susceptible to damage. Losses have gradually been reduced through improved cultural practices aimed at reducing inoculum and seedling susceptibility.

Tip dieback caused by Sirococcus strobilinus, Sphaeropsis sapinea, and Phoma eupyrena occurred at several nurseries on bareroot pine seedlings. Ponderosa pine and lodgepole pine were the most commonly affected species.

Pythium root disease (mostly P. ultimum) occurs at some level at most bareroot nurseries, and can also be found in container seedlings. Damage is usually minor and can be mitigated by improving water drainage in soil and container media.

STATUS OF CHRONIC DISEASE PROBLEMS

DISEASE	HOST	LOCATION/REMARKS
STEM & BRANCH DISEASES		
Aspen trunk rot	Aspen	Especially common in older aspen stands in southern Idaho
Atropellis canker	Lodgepole pine	Found in pockets in pole sized stands causing defect, topkill, and some mortality.
Comandra blister rust	lodgepole pine/ponderosa pine	Most common in SE Idaho; infrequent but may be locally severe.
Cytospora canker	True firs	Increased levels of symptoms, considerable branch flagging, and top-killing in localized areas. Frequently associated with western balsam bark beetle in southern Idaho.
Diplodia blight (Sphaeropsis blight)	Ponderosa pine	Is causing widespread branch dieback in many Idaho areas; severity decreased in northern Idaho in 1993.
Dwarf mistletoes	Douglas-fir, western larch, lodgepole and ponderosa pine	Widespread and damaging throughout the state.
Indian paint fungus (Rusty-red stringy rot)	True firs, hemlock	Causes 90 per cent of decay in these species throughout the state; especially common as age increases beyond 60 years.
Pinyon blister rust	Pinyon pine	Observed in the Raft River Mountains on the Sawtooth NF.
Red ring rot	Western larch, true firs, Douglas-fir, pines, spruce	Can cause serious decay problems in mature conifers.
Stalactiform blister rust	Lodgepole pine	Heavy infection has been observed in localized areas of the Boise, Payette, Sawtooth, and Targhee NF's.
Western gall rust	Lodgepole and ponderosa pine	Occurs throughout the host range; with localized areas of heavy infection.
White pine blister rust	Western white pine, limber pine, whitebark pine	Continues to be a major mortality factor in natural regeneration; becoming a major problem in subalpine pines.

ROOT DISEASES		
Annosus root disease	Pines, true firs, Douglas-fir, spruce	Causes mortality, root and butt rot especially in young trees near old stumps; frequently in complexes with other root diseases; may predispose trees to windthrow and/or bark beetles.
Armillaria root disease	Douglas-fir, grand fir, other conifers especially when young and improperly planted	In north Idaho, a widespread killer of all sizes of trees; a weak pathogen or in complexes in southern Idaho.
Black stain root disease	Pines, Douglas-fir	Found infrequently in Idaho; caused pinyon pine mortality in southern Idaho; usually in association with other root diseases.
Laminated root rot	Douglas-fir, true firs, occasionally other conifers	Primary killer in many stands from the Nez Perce NF north; may be found with Armillaria or other root diseases.
Schweinitizii root rot	Douglas-fir, pines	Common in mature and overmature forests throughout the state; frequently associated with other root diseases and bark beetles.
Tomentosus root disease	Douglas-fir, subalpine fir, Engelmann spruce, lodgepole pine	Usually found as root/butt rot with other root diseases; occasionally causes mortality. Most common in southern Idaho, but present throughout the state.
FOLIAGE DISEASES		
Conifer-Aspen rust Conifer-Cottonwood rust	Aspen, cottonwood, conifers	Commonly observed on hardwood hosts in southern Idaho; some clones were severely defoliated.
Rhabdocline needlecast	Douglas-fir	Very widespread but very light levels statewide; incidence decreased in 1993.
Swiss needlecast	Douglas-fir	Widespread in north Idaho; generally at very low levels of infection.
Elytroderma needlecast	Ponderosa pine	Widespread throughout the state but more prevalent in drier climates; levels continues to decline in 1993.
Fir broom rust	True firs	Widespread throughout the state; usually of little consequence, but is pandemic in stands south of the Snake River in southern Idaho.
Fir needlecast	Subalpine fir Grand fir	Infection occurred at low levels throughout the host type.

Fir needle rust	Subalpine fir	Variable infection levels on young trees throughout host type.
Larch needlecast & blight	Larch	Both diseases occur throughout Idaho. In Northern Idaho there was an increase in localized areas of heavy infection.
Lodgepole pine needlecast	Lodgepole pine	Widespread throughout Idaho; infection levels increased dramatically in 1993.
Marssonina blight Shepard's Crook	Aspen	Scattered incidence of light to heavy intensity throughout most of host range.
Pine needle rust	pines	Scattered incidence of light to moderate intensity scattered throughout the host types in southern Idaho.
Spruce broom rust	Engelmann spruce	Scattered through host range; most common in eastern Idaho.
White pine needlecast	Western white pine	Sporadic infections of lower crowns throughout north Idaho, especially near moist drainages.
NURSERY DISEASES		
Cylindrocarpon	Western white pine whitebark pine	Common in soil or contaminated containers, usually a saprophyte but may be a weak parasite, caused losses at several nurseries.
Diplodia tip blight	pines	Low levels in areas with a history of problems.
Fusarium root disease	Douglas-fir, larch, spruce, others	The most common and widespread nursery disease; amount of damage varies widely.
Grey mold	most conifers, esp. larch, spruce,	Common at low levels in many nurseries. Can be a serious storage problem.
Meria needlecast	larch	Infections levels were very low in 1993.
Phoma blight	pines	Commonly isolated from seedlings and soil samples.
Sirococcus tip blight	spruce, pines	Found at low levels at several nurseries.

SUMMARY OF DISEASE AND INSECT PROJECTS

THINNING DEMONSTRATION OF DWARF MISTLETOE-INFECTED LODGEPOLE PINE ON THE TARGHEE NATIONAL FOREST, IDAHO (Hoffman). Data was taken again from sixteen permanent plots on the Targhee National Forest. The 100-tree plots represent four replicates of four spacing level regimes thinned in 1983. Objectives of this long-term study are to determine: 1) the effects of pre-commercial thinning on growth of dwarf mistletoe infected lodgepole pine; 2) the changes of dwarf mistletoe incidence and intensity over time; and 3) the effects of dwarf mistletoe parasitism on growth and mortality of lodgepole pine. Plots are re-measured every 5-years.

ALTERNATIVES TO METHYL BROMIDE FUMIGATION - INCLUSION OF THE LUCKY PEAK FOREST NURSERY IN THE WEST-WIDE RESEARCH EFFORT (Hoffman). The USDA Forest Service nursery just outside of Boise, Idaho was included in a west-wide, five-year evaluation of alternative technologies for the management of soil-borne diseases and weeds in bareroot forest nurseries. The project will evaluate efficacy of different cultural regimes, including alternative cover crops, soil amendments, and crop rotation schemes to reduce the impacts of pests on conifer seedlings.

WHITEBARK PINE CONE AND SEED INSECT SURVEY (Kegley/Campbell) During 1994, we will begin to monitor whitebark pine forests for insects affecting their cones. Research has documented a rapid decline of this important species due primarily to white pine blister rust and periodic outbreaks of the mountain pine beetle. There is a need to promote natural regeneration and to supplement it artificially, especially with rust resistant nursery stock. To date, virtually nothing is known about the role cone and seed feeding insects play on the regeneration of this species. This project will help determine the impact cone and seed insects have on seed production of whitebark pine.

IMPACT OF HARVESTING ON WESTERN SPRUCE BUDWORM POPULATIONS. (Campbell/Kegley) Five timber sales on the Salmon River RD were evaluated in 1992 and 1993 to determine if harvesting had a significant effect on spruce budworm populations. The types of harvests evaluated were group selection, commercial thinning, and shelterwoods. Defoliation was rated and pheromone baited traps were placed in both cut and adjacent uncut areas. In 1992, twice as many moths were caught in the uncut areas than in the cut areas although the amount of defoliation in those areas was about the same. In 1993, there was little to no defoliation and no moths were caught in any of the treatments. Budworm populations were down significantly probably due to adverse spring and summer weather. This project will continue in 1994.

WESTERN SPRUCE BUDWORM PERMANENT PLOTS. (Campbell/Kegley). Permanent plots on the Nez Perce NF were re-measured for defoliation and budworm population estimates. These plots are part of a west-wide project to validate and calibrate the western spruce budworm extension of the PROGNOSIS model and gather long-term data on budworm effects on stand structure and ecosystem function.

WESTERN SPRUCE BUDWORM PHEROMONE TRAP EVALUATION. (Campbell/Kegley). 1993 was the final year in the study to correlate the number of adult moths caught in pheromone traps with egg mass and larval densities and resulting defoliation on the Nez Perce NF and several forests in Montana. Region 1 will now be using only trap catches and defoliation to monitor budworm populations. This information will be directly used to monitor budworm trends and impact on the Nez Perce NF. The information will also contribute to a west-wide effort to improve and standardize our monitoring techniques for budworm.

MOUNTAIN PINE BEETLE PERMANENT PLOTS. (Kegley) Permanent plots were remeasured on the Bonner's Ferry RD, IPNF's, in northern Idaho. These plots will help calibrate the Cole/McGregor mountain pine beetle rate of loss model for northern Idaho. Additional plots will be installed in 1994.

EVALUATION OF THE FLIGHT PERIOD OF THE WESTERN BALSAM BARK BEETLE. (Kegley/Gibson) Pheromone baited Lindgren funnel traps were placed in the Trout Creek drainage of the Bonners Ferry RD, IPNF's and on the Bitterroot NF to monitor the flight period of the western balsam bark beetle. Beetles were caught from June 4 through Sept. 30. Peak flight occurred between June 12-23 and July 22-29. The cool, wet summer of 1993 may have had an affect on the population and the traps will be monitored again in 1994.

DOUGLAS-FIR TUSSOCK MOTH PERMANENT PLOTS. (Campbell/Kegley). Permanent plots on the Palouse RD, Clearwater NF were measured for defoliation and tussock moth population levels using pheromone traps. Only a few moths were caught and little or no defoliation noted. This is a long-term project that will help calibrate/validate the Douglas-fir tussock moth extension of the PROGNOSIS model.

CONE AND SEED INSECT MONITORING. (Kegley). New methods for monitoring cone & seed insects continued to be tested in white pine orchards in northern Idaho. Technical difficulties with black light traps for monitoring coneworms have been overcome but populations were very low in 1993. Black light traps will be re-tested in 1994.

RED TURPENTINE BEETLE DAMAGE IN PRUNED AND EXCISED WHITE PINE. (Kegley/Schwandt). Monitoring for red turpentine beetle attacks in recently pruned western white pine plantations continued in 1993. Five plantations on the Fernan RD and one on the Wallace RD were evaluated. Beetle attacks were found on 0 to 9 percent of the trees examined. Attacked trees on each plantation averaged from 1.3 to 3.3 inches in diameter.

In a plantation on the Palouse RD, where 41 per cent of the trees were attacked in 1992, 27 per cent had new attacks in 1993. Mortality fell from 10 per cent in 1992 to 3.5 per cent in 1993. In a tagged tree study at Lamb Creek where 47 attacked trees were tagged in 1992, 19 per cent of those died in 1993. Twenty-six percent of those attacked in 1992 had fresh attacks in 1993. In an additional study, 19 pairs of trees were pruned in May 1993. In each pair, one tree was pruned up to the top whorl and the other tree was pruned normally, which is halfway up the crown. By Aug. 23, 10 of the severely pruned trees were attacked by red turpentine beetles and 5 of the normally pruned trees were attacked. The diameter of the smallest tree attacked was 1.3 inches. We will continue to monitor these trees for mortality and expand our survey to other districts in 1994.

VERBENONE AND IPSENOL AS ANTI-AGGREGANTS OF PINE ENGRAVER. (Gibson/Livingston) In this test, conducted in ponderosa pine stands on private land, northeast of Missoula, and north of Coeur d'Alene, we evaluated the effectiveness of aggregating pheromones of competitor beetles as anti-aggregants of the pine engraver. Applied in bubble-capsule formulations, one each of verbenone and ipsenol; we treated freshly-created slash piles with four treatments of paired capsules. Four piles received no capsules, four received 5 pairs, four 10 pairs, and four 15 pairs. Slash piles were created and treated in April. Evaluation was completed in June. Beetle flights were somewhat atypical this year and appeared to have influenced the evaluation results. Still some treatment effect was noticed. Because treatment effect was not as pronounced as we had hoped, we plan to repeat the test in 1994, while monitoring the flight more carefully to guide us in the timing of the evaluation.

ARMILLARIA/FERTILIZER STUDY. (Schwandt) Preliminary results have found that trees infected with Armillaria root disease have higher sugar and starch levels and lower levels of tannins and phenolics than uninfected trees. This information agrees with other studies that have found Armillaria to be a "sugar-loving" fungus. Bark samples from trees under different fertilizer regimes are currently being analyzed. Preliminary results indicate that trees fertilized with potasium fertilizer have higher phenolic and tannin concentrations than trees fertilized with nitrogen only. We hope that continued monitoring of these plots will find a change in the amount or activity of root disease, but the data does not differ significantly at this time.

AERIAL APPLICATION OF MCH TO PROTECT STANDING GREEN DOUGLAS-FIR. (Gibson) MCH, the anti-aggregating pheromone of Douglas-fir beetle has proven effective in preventing beetle attacks in windthrown Douglas-fir. We had hoped to evaluate its effectiveness in protecting standing, uninfested Douglas-fir that were threatened by nearby beetle populations. Conducted on the Kootenai NF, north of Libby; we treated 17, 10-acre blocks in April. Four treatments were evaluated--no treatment, 10 grams MCH per acre, 30 grams per acre and 100 grams per acre. The 30-gram treatment was equivalent to the "standard" treatment of 4 pounds of polymer beads--containing 2% MCH--per acre. Treatment evaluation was conducted in September. Unfortunately, there were not sufficient beetle attacks in any of the blocks to assess treatment effect. We believe the abnormally cool and wet summer sufficiently disrupted, or prolonged, beetle flight in that area, and populations were significantly reduced.

AERIAL APPLICATION OF VERBENONE TO PROTECT UNINFESTED LODGEPOLE PINE. (Gibson) Verbenone has been shown to be one of the important anti-aggregants of mountain pine beetle. It has been tested, with mixed results, as a means of protecting lodgepole pine stands from beetle attack until silvicultural manipulations could be used to reduce the stand's susceptibility. The test conducted in 1993, on the Superior and Plains/Thompson Falls RDs, Lolo NF, was an effort to reproduce one of our more successful tests, conducted in 1988 in northwest Montana. We aerially applied 4 pounds per acre of verbenone-impregnated polymer beads to six, 20-acre blocks. Five additional blocks served as checks. Bead application was made twice-once before beetle flight, in June; the second during beetle flight, in August. Project evaluation was conducted in September. Though beetle flight was late, and less than anticipated, there were sufficient new attacks in all blocks to indicate there was little treatment effect. We do not consider these results an indictment against verbenone. Rather, we believe further testing of beads and their elution rates is needed before retesting this promising protectant strategy.

FLIGHT MONITORING OF THE PINE ENGRAVER AND DOUGLAS-FIR BEETLE (Livingston) Flight monitoring was conducted northwest of Athol in a stand of ponderosa pine for the pine engraver, and approximately two miles north of Fourth of July Pass on Interstate 90 east of Coeur d'Alene for the Douglas-fir beetle. There have been continuing populations of beetles in both areas.

DWARF MISTLETOE INFECTION OF YOUNG WESTERN LARCH. (Mathiasen) This study was begun in 1991 and continued in 1992 and 1993. The objective is to determine the ages at which young western larch are initially infected by larch dwarf mistletoe. Young infected larch are being sampled and their age and height when first infected determined by aging all mistletoe infections on each tree. Several temporary plots are being established around mistletoe-infected seed trees. Infection of young regeneration near the seed trees will be monitored for several years to determine infection rates in regeneration.

EFFECTS OF PRECOMMERCIAL THINNING IN MIXED CONIFER STANDS INFESTED WITH ARMILLARIA ROOT DISEASE. (Mathiasen) This project was a cooperative effort between the Idaho Department of Lands and the Intermountain Research Station. The primary objective of the study was to compare mortality rates of different tree species in ecologically similar, precommercially thinned and unthinned Armillaria-infested mixed conifer stands. Field data was collected from June-September, 1993 on Idaho State lands near Orofino, Idaho. The data will be summarized during 1994. Based on the comparison of mortality rates, recommendations related to precommercial thinning in Armillaria-infested mixed conifer stands will be further evaluated. Other objectives of the study are to examine the biological species of Armillaria present in the study areas and determine the role of the various species in causing damage. This aspect of the study was begun in 1993 and will continue in 1994.

MONITORING OF FIELD PERFORMANCE OF BLISTER RUST-RESISTANT WESTERN WHITE PINE. (Mathiasen/Schwandt) This study is designed to monitor blister rust infection in F^1 and F^2 plantations operationally planted on state and federal lands, particularly at high rust hazard sites. Permanent plots established in plantations representing different levels of rust hazard will be revisited to document changes or trends in blister rust infection and pine mortality. Young plantations are being monitored because it is easier to distinguish between naturally regenerated and planted seedlings and to more accurately identify causes of mortality as it occurs.

Ten plantations on Idaho state lands have been surveyed thus far. All of the state plantations represent the F^2 generation of rust-resistant western white pine stock. However, it was recently discovered that six of the ten plantations accidently had wild stock planted among the rust-resistant stock. Since there is no practical means of distinguishing which trees are wild and which are rust-resistant, data from these six plantations can not be used to evaluate the performance of rust-resistant western white pine. Seven national forest plantations have been sampled. Two of these plantations represent F^1 stock and the remainder represent F^2 stock. Results for 1991-92 were summarized in a progress report that was completed in early 1993.

FOREST HEALTH ASSESSMENT USING DISEASE AND INSECT REGIME. (Hagle) Insect and disease activities can have a significant impact on vegetation patterns, and changes in vegetation caused by other circumstances may have a significant effect on insect and disease activities. The patterns of these activities can be recognized as "regimes", like fire regimes, which are associated with vegetation, physical features and climatic influences of a location over a long period of time.

A team of pathologists and entomologists is currently describing significant insect and disease regimes and their associated functions for broad geographic areas in the Northern Region. We are comparing the relative prevalence of these regimes in current forest with those in the past based on historical surveys, archived data, and maps. Our objective is to provide a more comprehensive understanding of the current health of forests in this region, the historical roles of insect and disease, and the health trends expected during the next few decades.

The emphasis is on the significant forest functions of insects and diseases rather than population dynamics or impacts of individual pests. In this first phase of our analysis, we are addressing insect and disease effects on forest succession and fiber production in northern Idaho forest. Information from this phase should be useful for forest plan revisions. In the future, we plan to model the outcomes of various management scenarios.

NURSERY DISEASE PROJECTS (James)

1. The U. S. Environmental Protection Agency has listed methyl bromide (a common soil fumigant used in bareroot forest nurseries throughout the United States) for phaseout by the year 2000. This chemical fumigant has been classified as depleting stratospheric ozone and will therefore be removed from production, use, and import in the United States. As a result, projects have been initiated to develop alternatives to methyl bromide in particular and chemical soil fumigants in general in forest seedling production in bareroot nurseries. Alternatives currently being tested include organic soil amendments, bare fallow periods with periodic cultivation, and different cover crops. Field plots have been established and will be monitored for effects of different treatments on seedling production and quality.

2. Investigations into the epidemiology of Cylindrocarpon spp. in container seedling greenhouses are continuing. Evaluations include characterizing species involved in disease, assessing pathogenicity, and formulating procedures to reduce disease losses. An evaluation to investigate fate of Cylindrocarpon spp. on outplanted white pine seedlings and their role on seedling performance is being conducted in cooperation with the University of Idaho and Potlatch Corporation.

3. Investigations into the pathogenic potential of Fusarium spp. on conifer seedlings is continuing. Techniques have been developed for rapidly screening suspected pathogenic isolates for their potential to elicit disease on young conifer germinants. These tests indicate that most isolates of F. proliferatum are aggressive pathogens whereas species of F. oxysporum vary greatly in their ability to cause disease. Pathogenic behavior information has been supplemented with recent genetic work indicating low genetic variability in isolates of F. proliferatum, whereas isolates of F. oxysporum associated with conifer seedlings exhibit a wide genetic variability (in cooperation with the University of British Columbia and B. C. Research Corporation, Vancouver, B.C.).

4. An evaluation will be forthcoming to determine efficacy of non-pathogenic Fusarium oxysporum to control root disease of conifer seedlings caused by pathogenic fusaria. Initial tests will be limited to laboratory and greenhouse evaluations. Depending on results of initial tests, tests at other nurseries in bareroot and container conditions may be initiated (in cooperation with the University of Idaho).

COMMON AND SCIENTIFIC NAMES OF INSECTS

Balsam woolly adelgid	*Adelges picea* (Ratzburg)
Boxelder leafroller	*Caloptilia negundella* (Chambers)
Cone feeding adelgid	*Pineus coloradensis* (Gillette)
Cone moth	*Eucosma recissoriana* Heinrich
Cone worms	*Dioryctria* spp.
Cranberry girdler moth	*Chrysoteuchia topiaria* (Zeller)
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopk.
Douglas-fir tussock moth	*Orgyia pseudotsugata* McDunnough
Fir engraver	*Scolytus ventralis* LeConte
Gypsy moth	*Lymantria dispar* (L.)
Lodgepole terminal weevil	*Pissodes terminalis* Hopping
Mountain pine beetle	*Dendroctonus ponderosae* Hopk.
Pine engraver	*Ips pini* (Say)
Pine needle sheath miner	*Zelleria haimbachi* Busck
Red turpentine beetle	*Dendroctonous valens* Le Conte
Rusty tussock moth	*Orgyia antiqua* (L.)
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Tip moth	*Rhyacionia zozara* (Kearfott)
Western balsam bark beetle	*Dryocoetes confusus* Swaine
Western conifer seedbug	*Leptoglossus occidentalis* Heidmann
Western pine beetle	*Dendroctonus brevicomis* LeConte
Western pine shootborer	*Eucosma sonomana* Kearfott
Western spruce budworm	*Choristoneura occidentalis* Freeman

COMMON AND SCIENTIFIC NAMES OF DISEASES

Annosus root disease	*Heterobasidion annosum* (Fr.) Bref.
Armillaria root disease	*Armillaria ostoyae* (Romagn.) Herink
Atropellis canker	*Atropellis piniphila* (Weir) L. & H.
Black stain root disease	*Leptographium wagneri* (Kendr.) Wingf.
Brown cubical butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Comandra blister rust	*Cronartium comandrae* Pk.
Conifer-Aspen rust	*Melampsora medusae* Thum.
Conifer-cottonwood rust	*Melampsora occidentalis* Jacks.
Cylindrocarpon root disease	*Cylindrocarpon* spp.
Cytospora canker of firs	*Cytospora abietis* Sacc.
Diplodia tip blight	*Sphaeropsis sapinea* (Fr.) Dyko
Dutch elm disease	*Ceratocystis ulmi* (Buism.) C. Mor.
Dwarf mistletoes	*Arceuthobium* spp.
Elytroderma needlecast	*Elytroderma deformans* (Weir) Dark.
Fir broom rust	*Melampsorella caryophyllacearum* Schroet.
Fir needlecast	*Lirula abietis-concoloris* (Mayr:Dearn) Darker
Fir needle rust	*Pucciniastrum epilobii* Otth
Fusarium root disease	*Fusarium* spp.
Grey mold	*Botrytis cinerea* Pers. ex Fr.
Indian paint fungus	*Echinodontium tinctorium* (Ell.& Ev.) Ell. & Ev.
Laminated root rot	*Phellinus weirii* (Murr.) Gilb.
Larch needle blight	*Hypodermella laricis* Tub.
Larch needlecast	*Meria laricis* Vuill.
Lodgepole pine needlecast	*Lophodermella concolor* (Dearn.) Dark.
Marssonina blight	*Marssonina populi* (Lib.) Magn.
Phoma blight	*Phoma* spp.
Pine needle rust	*Coleosporium sp.*
Pythium root disease	*Pythium ultimum* Trow.
Red ring rot	*Phellinus pini* Pilat.

Rhabdocline needle cast	*Rhabdocline pseudotsugae* Syd. *Rhabdocline weirii* Parker & Reid
Schweinitzii root/butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Shepard's crook	*Venturia macularis* (Fr.) E.Muller & Von Arx
Sirococcus tip blight	*Sirococcus strobilinus* Preuss.
Stalactiform rust	*Cronartium coleosporioides* (Diet. & Holw.) Arth.
Spruce broom rust	*Chrysomyxa arctostaphyli* Diet.
Spruce mottled needlecast	*Rhizosphaeria kalkhoffii* Bud.
Swiss needle cast	*Phaeocryptopus gaeumannii* (Rhode) Pet.
Tomentosus root disease	*Inonotus tomentosus* (Fr.) Gilb.
Western gall rust	*Endocronartium harknessii* (Moore) Hir.
White pine blister rust	*Cronartium ribicola* Fisch.
White pine needlecast	*Lophodermella arcuata* (Darker) Darker

RECENT PUBLICATIONS

Anhold, J. 1993. A biological evaluation of spruce beetle activity in the Neffs Management Area, Fishlake, Loa Ranger District. FPM Report 93-01. Ogden, UT:USDA Forest Service, Intermountain Region. 3 p.

Beckwith, R.C., D. Grimble, and J.C. Wearherby. 1993. Instar development of the Douglas-fir tussock moth in relation to field temperatures. USDA Forest Service Research. Note PNW-RN-512. Pacific Northwest Research Station Portland, Oregon. 4 p.

Byler, J.W., R.G. Krebill, S.K. Hagle, and S.J. Kegley. 1993. Health of the Cedar-Hemlock-Western White pine forest of Idaho. In Proceedings of Symposium: Interior Cedar-Hemlock-White pine Forests: Ecology and management. March 2-4, 1993. Spokane, Wa. (in press).

Dumroese, R. K., R. I. James, and D. L. Wenny. 1993. Fusarium root infection of container-grown Douglas-fir: effect on survival and growth of out planted seedlings and persistence of the pathogen. New Forest 7: 143-149.

Gardner, B. 1993. Bibliography Intermountain Region Forest Pest Management Publications, 1921-1993. FPM Report 93-08. Ogden, Utah: USDA Forest Servive, Intermountain Region, 48 p.

Gast, S.J., M.W. Stock, and M.M. Furniss. 1993. Physiological factors affecting attraction of Ips pini (Coleoptera: Scolytidae) to host odor or natural male pheromone in Idaho. Ann. Entomol. Soc. Am. 86(4): 417-422.

Gibson, K. and B. Oakes. 1993. Bark Beetle Conditions, Northern Region, 1992. USdA Forest Service. Northern Region. Forest Pest Mgt. Rpt 93-3. 27 p.

Haack, R.A., and J.M. Byler. 1993. Insects and pathogens: Regulators of forest ecosystems. J. Forestry 91 (9): 32-37.

Hagle, S.K., and R.M. Schmitz. 1993. Managing root diseases and bark beetles. In: Schowalter, R.D. and B.M. Filip, eds., Beetle-pathogen interactions in conifer forests. Academic Press. p.

Hagle, S.K., and J.W. Byler. 1993. Root diseases and natural disease regimes in a forest of western U.S.A. In: UIFRO, Root and Butt Rot Conference, Uppsala, Sweden and Helsinki, Finland. 12p. In press.

Hagle, S.K., 1993. Rating for root disease severity. In: Frankel, S., comp., Proceedings of Western International Forest Disease Work Conference, USDA Forest Service, Pacific Southwest Region. p. 80-86.

Hagle, S.K., 1993. Forest health in sustainable ecological systems. In: Frankel, S., comp., Proceedings of Western International Forest Disease Work Conference, USDA Forest Service, Pacific Southwest Region. p. 112-116.

Hagle, S.K., J.W. Byler, S. Jeheber-Matthews, R.Barth, J.Stock, B.Hansen, and C.Hubbard. 1992. Root disease in the Couer d'Alene River Basin: an Assessment. USDA Forest Service, Idaho Panhandle National Forests, 23 p.

Hagle, S.K., and C.G.Shaw, III. 1991. Avoiding and reducing losses from Armillaria root disease. In: Shaw, C.G., III and G.A. Kile, eds., Armillaria root disease. USDA Forest Service Agriculture Handbook No. 691. p. 157-173.

Helzner, R., R. Thier. 1993. Pine butterfly in southern Idaho: 1893-1984. FPM Report 93-06. Ogden, Utah: USDA Forest Service, Intermountain Region, 25 p.

James, R. L. 1993. Evaluation of diseases of container-grown conifer seedlings - Colville Confederated Tribal Greenhouse, Nespelem, Washington. USDA Forest Service. Timber, Cooperative Forestry and Pest Management. Report 93-6. 14 p.

James, R. L. 1993. Fusarium species associated with post-emergence damping-off and root disease of young container-grown Douglas-fir seedlings - USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service. Timber, Cooperative Forestry and Pest Management. Nursery Disease Notes No. 129. 5 p.

James, R. L. 1993. Phytophthora root crown disease of western larch at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service. Timber, Cooperative Forestry and Pest Management. Report 93-4. 12 p.

James, R. L. 1993. Septoria leaf spot of Prunus virginiana seedlings - Bitterroot Native Growers Nursery, Hamilton, Montana. USDA Forest Service. Timber, Cooperative Forestry and Pest Management. Nursery Disease Notes No. 130. 7 p.

James, R. L., R. K. Dumroese and D. L. Wenny. 1993. Principles and potential for biocontrol of diseases in forest and conservation nurseries. In: Landis, T. D. (tech. coord.). Proceedings: Western Forest Nursery Association. USDA Forest Service. Rocky Mountain Forest and Range Experiment Station. Gen. Tech. Rept. RM-221. p. 122-131.

Livingston, R. L. 1992. Forest Health in Idaho, Drought, lack of fire contribute to Idaho's forest health problems. Northwest Woodlands 8(4): 12-13.

Livingston, R. L. and D. P. Beckman. 1993. Douglas-fir beetle evaluation, Long Meadow Unit. Ponderosa District, Clearwater Administrative Area, Idaho Department of Lands. Idaho Department of Lands, P.O. Box 670, Coeur d'Alene, ID. Insect and Disease Report No. IDL 93-3; 18 p.

Mathiasen, R. L., and J. W. Schwandt. 1993. Monitoring genetically improved western white pine plantations for blister rust infection in northern Idaho: Idaho State and Forest Service Lands Establishment and Preliminary Results: 1991-92. Idaho Dept. Lands, Coeur d'Alene, Id. Insect and Disease Report IDL 93-2 10 p.

Mason, L. and R.L. Livingston. 1993. State of Idaho gypsy moth survey trapping program summary report, 1993. Idaho Department of Lands, P.O. Box 670, Coeur d'Alene, Id. Insect and Disease Report No. IDL 93-4. 6 p.

Schwandt, J.W., S. J. Kegley, and C. Brengle. 1993. Forest Health and Vegetation management: Recommendations for the US Army Corps of Engineers recreation Areas on the Pend O'Reille River. (no pub #) 15 p.

Schwandt, J. W., M.A. Marsden, G. I. McDonald. 1993. Pruning and thinning effects on white pine survival and volume in northern Idaho. In Proceedings of Symposium: Interior Cedar-Hemlock-White pine Forests: Ecology and management. March 2-4, 1993. Spokane, Wa. (in press).

Taylor, Jane E., Terry Reedy and Tom Corse. 1993. Permanent plots for studying the spread and intensification of larch mistletoe and the effects of the parasite on growth of infected western larch on the Flathead Indian Reservation, Montana. USDA Forest Service, Northern Region; Timber, Cooperative Forestry and Pest Management; Report 93-5; 13 p.

Thier, R., S. Munson. 1993. Efficacy of MCH to prevent spruce beetle infestation. FPM report 93-02. Ogden, Utah: USDA Forest Service, Intermountain Region, 8 p.

Thier, R. 1993. A field test of the efficacy of MCH in preventing Douglas-fir infestation by Douglas-fir beetle. FPM Report 93-03. Ogden, Utah: USDA Forest Service, Intermountain Region, 7 p.

Weatherby, J., R. Thier. 1993. Preliminary validation of a Douglas-fir beetle hazard rating for use in southern Idaho. FPM Report 93-04. Ogden, Utah: USDA Forest Service, Intermountain Region, 14 p.

Weatherby, J., R. Thier. 1993. Preliminary validation of a Douglas-fir beetle hazard rating system, Mountain Home Ranger District, Boise National Forest. FPM Report 93-05. Ogden, Utah: USDA Forest Service, Intermountain Region, 7 p.

DOUGLAS-FIR BEETLE
WESTERN PINE BEETLE
PINE ENGRAVER BEETLE
MOUNTAIN PINE BEETLE

1993

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF IDAHO

Scale 1:1,000,000
1 inch equals approximately 16 miles

0 10 20 30 40 Miles
0 10 20 30 40 50 Kilometers

Datum is mean sea level

Compiled and printed by the cartography of Society, 1992 North American datum
Lambert conformal conic projection, standard parallels 33° and 45°

LEGEND

SOURCE DATA

POPULATION KEY

BOISE	more than 25,000
TWIN FALLS	10,000 to 25,000
KELLOGG	2,500 to 10,000
Silverton	1,000 to 2,500
Harrison	less than 1,000

BASE MAP

FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO, 80225 OR WASHINGTON, D.C. 20242
COMPILED IN 1964
EDITION OF 1968

IDAHO

BALSAM BARK BEETLE
SPRUCE BEETLE
FIR ENGRAVER
BALSAM WOOLLY ADELGID

1993

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF IDAHO

Scale 1:1,000,000
1 inch equals approximately 16 miles

Datum is mean sea level

Compiled, edited, and published by the Geological Survey
1927 North American datum
Lambert conformal conic projection based on standard parallels 33° and 45°

LEGEND

- State capital
- County seat
- City, town, village or locality
- Scheduled service airport
- Built up area shown for towns over 5,000 population

SOURCE DATA

U. S. Dept. of the Interior, Geological Survey, topographic maps
U. S. Dept. of the Air Force, Corps of Engineers, topographic maps

BASE MAP

POPULATION KEY

BOISE	more than 25,000
TWIN FALLS	10,000 to 25,000
Kellogg	2,500 to 10,000
Smelterville	1,000 to 2,500
Harrison	less than 1,000

Population indicated by size of letters

FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225 OR WASHINGTON, D.C. 20242
COMPILED IN 1964
EDITION OF 1968

IDAHO